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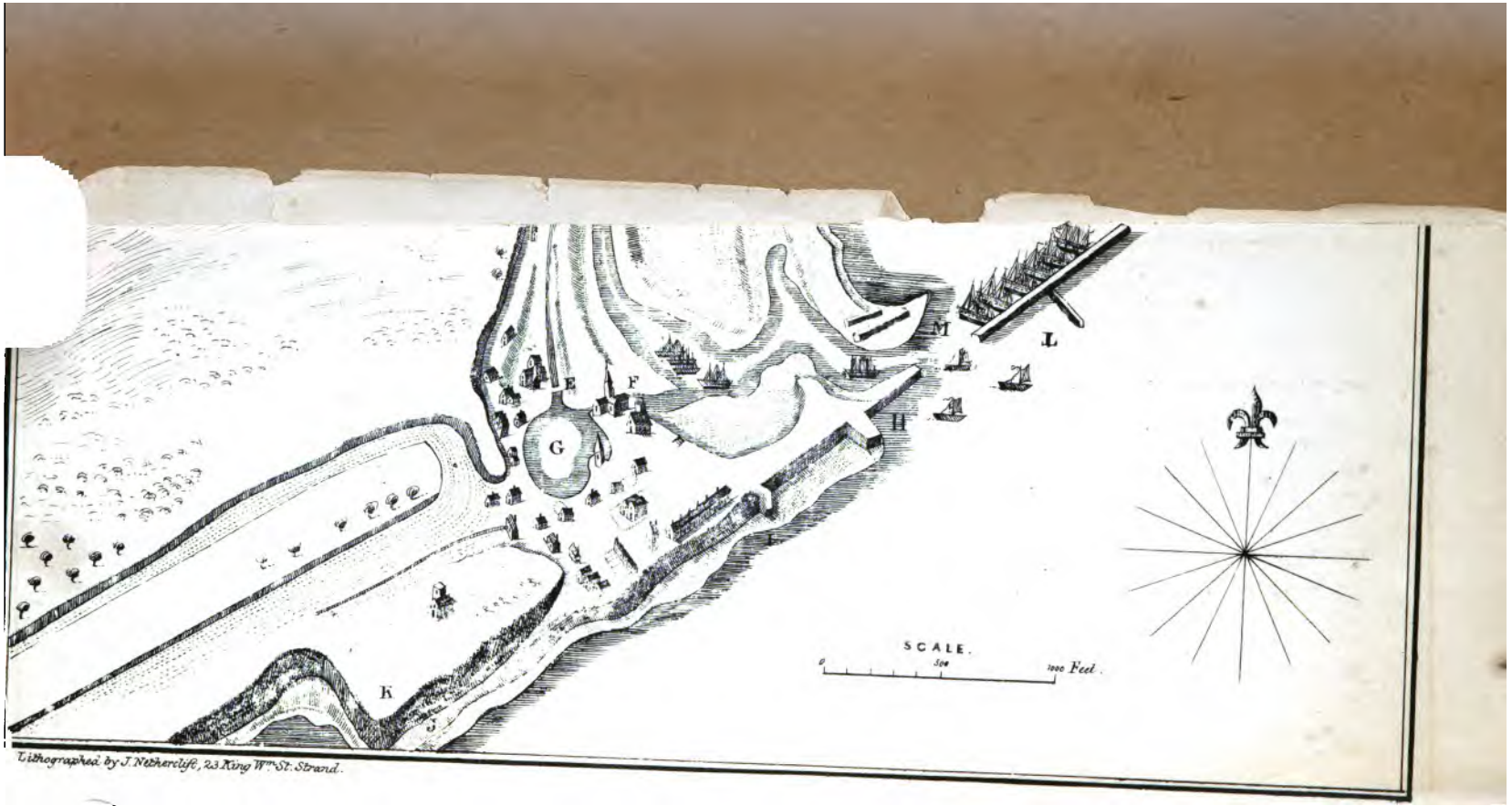

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PROPOSED PLAN

FOR

IMPROVING

DOVER HARBOUR,

BY AN

EXTENSION OF THE SOUTH PIER HEAD, &c.

ALSO, COPIOUS EXTRACTS FROM VARIOUS AUTHORS IN SUPPORT OF THE PLAN, AND SHEWING THE IMPORTANCE OF DOVER HARBOUR FROM THE TIME OF ITS FIRST CONSTRUCTION.

TOGETHER WITH

PRACTICAL OBSERVATIONS & ILLUSTRATIONS.

BY

LIEUT. B. WORTHINGTON, R. N.

" Nothing extenuate,
" Nor set down aught in malice."

DOVER:
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ADDRESS.

In offering the following observations to the notice of the public, I feel that it is necessary to explain some of the motives which have induced me to do so; as well as the cause of my coming forward thus publicly, partly, it may be said, in opposition to the present plans of the Honorable Commissioners of Dover Harbour and their advisers; and also the reason of my doing so at the present time.

1st, then, I declare that my motives are entirely uninfluenced by the most remote views of personal advantage; for, under any circumstances, I should decline the acceptance of profit or emolument of any kind, supposing the plans which I propose for the improvement of Dover harbour, should be adopted—This pledge I make without the slightest reservation.

2nd. The cause of my seeking the improvement of Dover harbour arises from a sincere desire to have it effected. I am also fully persuaded that this *can* be accomplished; and whether we look upon the port in a national or local point of view—at its importance as a packet station, as a harbour of refuge, as a port of communication with the continent in times of peace, or as a rendezvous for armed vessels in times of war, surely, to accomplish such an object, as its improvement, must be acknowledged by all to be highly desirable for the prosperity of the town, and the advantage of the country at large.

3rd. The reason of my coming forward at this time, is, more particularly to draw the public attention to the fact, that it is still contemplated by the Commissioners of the harbour to rebuild Cheeseman's Head, and to

extend the present apron farther seaward, (at least it is generally believed that this is their intention,) and as in doing this they must, of necessity, lay out a considerable sum of money in securing the land between Cheeseman's head, and the South Pier, I shall endeavour to shew, that by extending the said head, not one single advantage would be derived, over that which I propose by a breakwater; and that the principal advantages to be gained by the breakwater, would be entirely lost in consequence.

But perhaps it may be supposed by some, that I am travelling out of my course, by my endeavours to improve the state of Dover harbour; whilst others may imagine that I am merely exercising a professional privilege: but whatever opinions may be formed in these respects, I trust I shall be able fully to exonerate myself from any charge of obtrusive interference, when I state that the first impulse to do so was given by my being called upon to give evidence before a Committee of the House of Commons, appointed to enquire into the state of Dover harbour; and that I never sought or expected to be called upon to give an opinion on the subject, having considered that my opinion would not have been thought of the least value in so high a quarter. The time, however, that elapsed between my receiving my summons, and that of my being called upon to attend, gave me some opportunity to direct my attention to a plan of improvement; and, by the time I was directed to appear, I had partially developed the one which I have since had modelled in an improved form, and which I have submitted to the inspection of many scientific gentlemen, naval and military officers, engineers, &c. many of whom have voluntarily sent me their testimonials in its favor. In the following pages I shall endeavour to give an explanation of these improvements, whilst I invite a further knowledge of them by an inspection of the model itself.

On being called upon to give my evidence before the Committee of the House of Commons, I considered that it would be very unfair and unbecoming in me to find fault with the state of Dover harbour, or the works then in progress, without being able to suggest what I might think a remedy. The question having been put to me by the Committee, as to whether I had any plan to propose, in order to meet the evils

complained of in Dover harbour, I presented a small map, delineating the additions and extensions which I had thought of; as also, a small model of a portion of a proposed experimental breakwater, which I was requested to explain. The impression produced in the Committee by the explanation I then gave, may be judged of by the fact of my having been recalled, in about half an hour afterwards, when I was requested to deliver in my views in writing, on the following morning. This I did, although labouring under great disadvantages, on account of my not being prepared for such an application; but the favorable manner in which my plan was received, induced me, on my return to Dover, to revise it; and, in order to make it more clearly understood, to shew, by a model, the whole of my proposed improvements.

I may also mention, that I was sent for by the Honorable Commissioners of Dover Harbour to attend their Board in the month of October, 1836; when I farther explained my views in regard to my plan for the improvement of the harbour; and that the opportunity thus afforded me to do so was quite unsolicited on my part, though it led to my plans being referred to the Engineer, together with the testimonials I had then received in its favor, as will be shewn by the copy of the minute of the Harbour Board, 18th November, 1836. These circumstances, therefore, added to the very flattering testimonials I had received, were a great encouragement to me to persevere in my endeavours to promote the good of the town by the improvement of the harbour; and, convinced as I am that it is the duty of every individual to use his best exertions for the good of his fellow creatures, I have resolved, without laying claim to great scientific knowledge, to persevere in my attempts to draw attention to the improvements I propose, and which I have every reason to believe, would, whether adopted wholly or in part, materially tend to render Dover harbour a safe and commodious port, and of easy access at all times. I therefore venture, with humble pretensions, to publish these observations, the correctness of which I shall endeavour to prove by fair argument and a reference to facts; because I do not desire to win converts to my opinions by sophistical reasoning. Indeed, such tactics would ill suit one like myself who has been accustomed through life to fair,

straight-forward, and open-handed dealing; and, who in early life, was educated in the school of usefulness, rather than that wherein literary blandishments were studied—in short, in that service whose great leader has left us on record the standing memento, that, "England expects every Man to do his duty." Acting on this principle I consider that we are equally bound, in times of peace, to employ our talents for the good of our country, as we are, in times of war, to draw the sword in its defence. I am quite aware that in publishing these observations, I shall have to run the gauntlet with a great variety of opinions, and am by no means a stranger to the ground on which I stand; for no doubt numerous difficulties and objections will be started to my propositions: but I have, nevertheless, this cheering consolation, that *my intentions are only to do good; and whatever may be the result of my labours, no harm being intended to any one, I shall have nothing to regret.*

The testimonials alone which I have already received, I consider an adequate reward for any sacrifice I may have made, either of my time or of my purse; and I shall cherish them as *tokens of success* whatever condemnation may be passed on me, from any other quarter. If, however, my plans do possess any merit, (which I am led to believe they do,) and should they be thought of sufficient interest to be considered before any other works are carried out, I claim no other courtesy than that of their being argued on their own merits, and by the rules of honorable hostility. My position, in any event, cannot be different from many others who have emerged from the crowd, and fixed the eyes of the public upon them

In the great human family there are to be found individuals of every diversity of temperament and understanding; and, some no doubt there are, amongst those who pretend to a knowledge of the efficiency of the present works, though they may be but slightly acquainted with my plans of improvement, who may be inclined to play with the feelings of those who, like myself, differ from them, with pettish malevolence and acrimony. Such persons are ever ready to display a narrowness of feeling in their bearing towards others who conceive they have an equal right to arrogate to themselves a knowledge no less correct than theirs; and, though no offence

has been given or intended to them, and though they are in no danger whatever of being *injured* by the success of any experiment, they may possibly charge me with a ridiculous perseverance in impracticable schemes, which are justly entitled to ignominy and reproach; and which deserve to be numbered with the uniform miscarriages of those imprudent speculations, the accomplishment of which is beyond human power. I am not, however, to be deterred by any fear of such reproaches, for my views are not confined within such narrow limits, particularly where the safety and welfare of so many depend upon my exertions and the successful issue of my plans, *especially too when no one but myself can be incommoded by their failure.*

It is true, men of first-rate scientific talents, have frequently been doomed to witness the greatest disappointments in the failure of their plans. Vain man is often deluded by his own weakness, and is often induced to make attempts which end in disappointment and mortification; and therefore an humble aspirant to do good ought not to be discouraged. It is the duty of every man to endeavour to contribute something, however trifling, to the sum of human happiness—to add much can indeed be the lot of few, but to add something, however small, is a hope that may be entertained without presumption; and it is certain that every honest endeavour, whether successful or not, generally meets its adequate reward.

It is not my wish or intention to throw any blame upon the present authorities of Dover harbour, for any failure of the plans which have been already tried. My observations will be directed to an experiment which would *add to*, instead of *diminishing the efficacy of the present works;* and, backed as it is by the opinions of many engineers, as the extracts from the different reports will abundantly shew, I shall *gratuitously* bring it forth and submit it to the examination of those who may be interested in the subject, trusting that my efforts may be viewed in the same *spirit* as that in which they are intended; and should any one differ from me, it must be remembered, that that difference can only be in opinion, as the result can only be determined by the experiment itself. My opinions however are supported by the most respectable testimonials; and, as the breakwater is only proposed as an experiment, I think it is deserving of a trial,

especially considering the trifling expense this experiment would incur, as compared with the advantages that would be attendant on its success, of which I myself entertain but little doubt. It is not according to any new system or theory that I have matured my plan; I have taken experience for my guide. The same effects which are produced on other parts of our coast, under similar circumstances, I may reasonably expect would be produced here. I know that nature plays many freaks, and often eludes and laughs at the projects of man; but in her freaks she is no respecter of persons: for the same laws govern her at all times, under similar circumstances, no matter who may be the projector of any plan to alter her course. In devising my plan I have endeavoured to strike at the root of three great evils—the *bar, the heavy swell* at the mouth of the harbour, and the *swell within* the harbour. If these can be obviated, lesser or imaginary evils ought not to be allowed to stand in the way of our attempts to produce such extensive benefits. Perfection is rarely obtainable in any undertaking; but the maximum of our efforts should ever be directed to the attainment of the greatest amount of good, by the most practicable means. I wish it likewise to be understood that my project would form an addition to the present works, and that it could easily be abandoned if proved unsuccessful; whilst the loss that would be occasioned by the experiment would be but trifling.

B. WORTHINGTON.

Dover, April 14th, 1838.

EXTRACTS,

SHOWING

THE STATE AND IMPORTANCE

OF

DOVER HARBOUR.

—✻—

The importance of Dover Harbour has been so universally acknowledged from the earliest period of our history, that no words of mine can add to its interest. I beg therefore simply to subjoin a few extracts relative to this subject, which may be interesting to those readers who may not have had an opportunity of seeing the original works, and in doing this I embrace the opportunity of impressing upon all who may have any influence with the Government, the Honorable Commissioners of Dover Harbour, the Admiralty, the Post Master General, the Trinity Board, and upon all who feel an interest in the *Commercial Prosperity* of our country, the imperative necessity there still is of further improving this Ancient Port, and making it what it ought to be (from its locality) the first in importance on the South-eastern coast of England.

EXTRACT FROM A MEMORIAL, PRESENTED TO QUEEN ELIZABETH BY SIR WALTER RALEIGH, KNIGHT.

"No promontory, town or haven, in Christendom, is so "placed by nature and situation, both to gratify friends, and "annoy enemies, as this town of Dover; no place is so settled

" to receive and deliver intelligence for all matters and actions " in Europe, from time to time; no town is by nature so " settled, either to allure intercourse by sea, or to train in- " habitants by land, to make it great, fair, rich, and populous; " nor is there in the whole circuit of this famous island any " port, either in respect of security and defence, or of traffic " or intercourse, more convenient, needful, or rather of neces- " sity to be regarded, than this of Dover, situated on a " promontory next fronting a puissant foreign king, and in " the very streight, passage, and intercourse of almost all the " shipping in Christendom.

"And if that our renowned King, (Henry 8th,) your " Majesty's father, found how necessary it was to make a " haven at Dover, (when Sandwich, Rye, Camber, and " others, were good havens, and Calais also was then in his " possession,) and yet spared not to bestow, of his treasure, " so great a mass, in building that pier, which then secured " a probable means to perform the same; how much more is " the same now needful, or rather of necessity, (those good " havens being extremely decayed,) no safe harbour being " left in all the coast almost between Portsmouth and Yar- " mouth. Seeing, then, it hath pleased God to give unto " this realm such a situation for a port and town, as all " Christendom hath not the like, and endowed the same with " all commodities by land and sea, that can be wished, to " make the harbour allure intercourse, and maintain inha- " bitants; and that the same once performed, must be " advantageous to the revenue, and augment the welfare and " riches of the realm in general; and both needful and neces- " sary, as well for the succouring and protecting friends, as " annoying and offending enemies, both in war and peace; " methinks, there remaineth no other deliberation in this case, " but how most sufficiently, and with greatest perfection " possible, most speedily the same may be accomplished."

STATE OF DOVER HARBOUR

BOTH BEFORE AND SINCE THE BUILDING OF THE PIER, WITH THE ALTERATIONS MADE BY THE BEACH, AS IT IS FOUND BY THE EXAMINATION OF THE MOST SENSIBLE, ANCIENT, AND SKILFUL MEN, BY DIRECTION OF THE LORD ADMIRAL OF ENGLAND, BEING AT DOVER, DEC. 21st. 1581.

[FROM THE ARCHAEOLOGIA, VOL. XI. P. 241.]

"Before the pier was built out, there are men alive can "remember that there was no banks or shelves of beach to "be seen before Dover, but all clean sea, between Archcliff "tower and the Castle cliff."

"By experience it hath been always found that as the "pier was built out, so the banks of beach also began "to grow, and lay farther out as the pier was farther built, "and as the pier hath decayed, so these banks of beach "also have been either scoured away, or driven farther in, "and that those banks of beach never rest farther forth "into the sea, then they are defended by the pier.

"Also it is found that the making of groins will ever en- "crease the quantity of beach, and the decay or pulling down "those groins, doth also cause the same bank of beach to "wear away so far forth as the groins are built or taken "away."

"Also it is found that the abundance of beach is so great "as they cannot be stayed by any groins, but that they "will fill the groins, and then go about them, holding on "their course as the flood carries them.

"Also that there is no other entrance or haven mouth "at this present, but such as the ebbing out of the sea water, "and course of the river do keep open."

"It is also found by experience that the same mouth or "entrance doth always grow nearer and nearer towards the "town; and that in times past it hath grown so near, that "by the violent rage of the sea, passing through the "same; a part of the town itself hath been in danger to be "overthrown."

"Also it is found, that the beach hath, and doth increase "still more and more, under and beyond the Castle."

"Also that lately where five rods of bavin work have been

"made up of the broken pier, the beach is also grown out to "the end thereof, and so groweth down from thence lower "and lower towards the town-ward."

"Also it is found that the great rocks that were sunken "by king Henry VIII. do still lie there, and are not re- "moved by any violence of sea, but by the wearing of them, "or looseness of the ground under them, have sunk somewhat "lower and lower."

"Also it is found that part of the pier standeth on a firm "rock of chalk, and part on a soft soil."

"Also it is apparent at this present, that where the beach "and ooze are incorporated together in a main shelf, it so "retaineth the water inclosed within the same, towards the "cliff, that there is ever a long standing pool of water, "twelve feet at least higher than the sea without at low water."

"*The names of such masters and townsmen of Dover, as "acknowledged with one consent, all the articles above "contained, to be very true.*"

THOMAS WATTSON	JOHN LEGEND
WILLIAM TYDEMAN	HARRY TYDEMAN
THOMAS SISELYE	THOMAS BROUNGER
JOHN HARTE	THOMAS HASELWOOD
JOHN GOULDSTONE	JOHN APHOWELL
WILLIAM GILBERTE	THOMAS PANTERYE

ARTICLES OF THE STATE OF DOVER HARBOUR,

RESOLVED UPON BEFORE MASTER RICHARD BARRIE, (LIEUT. OF DOVER CASTLE,) JOHN GARRET, (MAYOR OF DOVER,) AND THE JURATS THERE, JAN. 3rd, 1581, BY THE EXAMINATION OF THE MOST SENSIBLE, ANCIENT, AND SKILFUL MEN AND MARINERS OF DOVER, UPON CERTAIN QUESTIONS OR ARTICLES PROPOSED BY THOMAS DIGGES, ESQ. WHOSE NAMES ARE SUBSCRIBED AS FOLLOWS:—

[FROM THE ARCHAEOLOGIA, VOL. XI. P. 244.]

"First, they affirm that the wooden stairs of the pier did

"lie distant from the end of the bavin work now newly made, "six rods and four feet."

"Item, it is well remembered, that at full sea, a ship that "had drawn eighteen or twenty feet water, might have lain "her side to the said stairs."

"Item, they affirm that they have known lie in the bight "within the crane, at one time, the Faucon, the Sacre, the "Bark of Bulleyn, the Greyhound, the Rose Lyon, the "George and the Dragon of the kings. And they well "remember that ships of 200, and better, have ridden there.

"Item, it is known, by experience, that the said stairs "stand upon rocks of chalk, and that is rocks of chalk all "along."

"Item, they say that the inward bight or old harbour called "the Paradise, was much filled with ooze and beach, and that "the same was carried out by men's hands, for to make the "harbour better for the lodging of ships.

"Item, they agree and affirm that the South and South-"west winds do bring the beach. But it passeth away forth "without as it cometh, unless it be staid by groins."

"Item, they find that these winds that bring the beach will "carry away the same further on to the Castle as aforesaid. "And the East and E. North-east winds be the winds that do "most stay the beach without the pier."

JOHN GARRET, (MAYOR OF DOVER,)
THOS. ANDREWE, (BAILIE THERE,)
ROBERT FYNNETT,
THOMAS WATTSON,
ROGER GRYCE,
WILLIAM WELLYE,
THOMAS BRODGATE,
JOHN KNAPPE,
JOHN BARGAR,
} JURATS.

WILLIAM TYDYMAN,
RICHARD SISELYE,
COBHAM DOVES,
HARRY TEDYMAN,
JOHN LEGENT,
ROBERT BIRTE,
WILLIAM COURTNEY,
RICHARD CARTER,
THOMAS BRONGER,
JOHN HARTE,

ROBERTE EDGE, THOMAS MARYCHURCH,
JOHN TOOKE, THOMAS HASLEWOOD,
JOHN GOLSBY, ROBERTE FLEMMYNGE.

EXTRACT FROM CAMDEN'S BRITANNIA.

"Dover Harbour is the most frequent passage out of "England into France, which has rendered it famous through- "out the world.

"The town, which is seated among the rocks, (where the "haven itself formerly was, while the sea came up farther, "as is gathered from the anchors and planks of ships digged "up,) is more noted for the convenience of its harbour, "(though it has now but little of that left,) and the passage "from thence into France, than either its neatness, or popu- "lousness. For it is a famous passage; and it was formerly "provided by law, that no person going out of the kingdom "in pilgrimage, should take shipping at any other harbour. "King Henry 8th built a mole or pile (we call it the Pier) "wherein ships might ride with more safety. It was done "with great labour, and at infinite charge (£63,000) by "fastening large beams in the sea itself; then binding them "together with iron, and heaping upon it great quantities "of wood and stone."

"But the fury and violence of the sea was quickly too hard "for the contrivance of that good prince, and the frame of the "work, by the continual beating of the waves began to "disjoint. For the repair whereof Queen Elizabeth laid "out great sums of money, and by act of Parliament, a "custom for seven years was laid upon every English vessel "that either exported, or imported commodities."

EXTRACT FROM THE CHARTER, GRANTED BY KING JAMES THE FIRST, OCT. 6th, 1606.

"Whereas our Port of Dover, in our County of Kent, in

"the Eastern Division, and our Kingdom of England, in times "past for many ages, hath been a most noted and famous "Port and Harbour, as well for the safe and convenient "riding of ships which have put in there, or been outward "bound, as also for the most easy, speedy, and convenient "passing into France and other foreign ports beyond the "seas, not only upon the weighty and necessary affairs of the "kingdoms of our ancestors, and our kingdom of England "aforesaid, but also for the great benefit and advantage of "merchants, and other subjects of the said kingdom: and "whereas the said port in certain times passed, by the injury "of those times, and also chiefly by the raging of the sea "there in a wonderful manner, and by frequent and furious "storms, is fallen into such decay as scarce any ship can put "in or remain there, without damage or danger of being lost: "and whereas, also the late most serene Queens Elizabeth "and Mary, late Queens of England, and the most famous "King Edward the Sixth, and Henry the Eighth, late Kings "of England, our cousins and predecessors, and the most "renowned and prudent King Henry the Seventh, late also "King of England our great grandfather (whose true and "undoubted heir and successor to all his kingdoms without "all controversy we are,) have laid out and expended many "thousand pounds of lawful, &c. for supporting and repairing "the said port; and we also do lay out and expend, and shall "continually be compelled to lay out and be at charge in "like manner, unless we would suffer the extreme and final "ruin of the said port, which would be the greatest damage "and loss to this our famous kingdom of England."

EXTRACT FROM KILBURNE'S SURVEY OF KENT, 1657.

"The Pier (at a very great charge) was made by King "Henry 8th, and afterwards repaired by Queen Elizabeth "(in whose reign several acts of Parliament were made "towards the reparation thereof, and of the Harbour there,) "and one act was (for that purpose also made) in the time

"of King James (who incorporated the governors thereof by "the name of the Warden and Assistants of the Harbour "of Dover which Warden is the Lord Warden of the "Cinque Ports.")

"The Earl of Northampton (late Lord Warden of the "Cinque Ports) had (granted to him by the King) all the "lands from Pier-gate to the Pier; and he gave the same to "the Harbour of Dover; most part thereof was then waste, "but is since built upon, and the builders thereof pay "small rents for the same to the Pier."

EXTRACT FROM AN ANCIENT MANUSCRIPT

RELATIVE TO DOVER HARBOUR, ENTITLED "A BRIEF "MEMORIAL OF WHAT HATH BEEN DONE IN FORMER "TIMES, CONCERNING MAKING AND REPAIRING OF "DOVER HARBOUR."

"Although the first defence of Dover Harbour was a round "tower, made by a private person, one John Clark, Priest "and Master of the Maison de Dieu, about the year 1500, in "which he made many rings to fasten and moor ships; and "for the safety and pleasantness of it was called Little Para-"dise; yet when the making a formal and regular harbour "came into consideration, and that it was the opinion of all "skilful mariners of that time, that a mean harbour at Dover "would be more beneficial than an excellent harbour in any "place else, about the coast of England, Sir John Thompson, "Parson of St. James's in Dover, stirred up the townsmen "to entertain the project of obtaining a harbour, and to "represent the design to King Henry the 8th, who unani-"mously joining together, did send the said Sir John "Thompson to the King for that purpose, allowing him for "his support in his addresses and following the business, "£4:10."

"The King liked the design so well, that he forthwith "ordered £500. out of his own coffers, to make a beginning "of the work, and gave the mastership of the Maison de "Dieu to Sir John Thompson, and appointed him to be

"principal surveyor of the works, and under him to be four "overseers. His design was to erect a wall, which he called "a pier, from Haycliff Chapel (being the South-west part of "the bay) directly towards the East, about one hundred and "thirty-one rods in length. But the pier was not finished by "three hundred and fifty feet so far as the foundation was laid, "called the Mole-head, consisting of great rocks, brought "from Haycliff, the Castle bay, and Folkstone: this pier was "begun on St. Ann's day, 1533."

"The king spent £50,000, upon the works, and several "times in person viewed them, often employing the counsel "and direction of all skilful men in water-works, both at "home and abroad. But by reason of the King's absence at "Boulogne, his sickness at his return, his death, and the "nonage of Edward 6th, there was no provision made for the "maintenance of the works, which had been done about the "Pier, and they coming once into a state of decay nothing "was done towards it till Queen Mary's time, when for two "years some matters were attempted; the Mayor of Dover "and his brethren having got licence under the great seal, "to gather money throughout England, but the workmen "being ill paid, all was given over again. Before the end "of the work a south-west wind brought a marvellous quantity "of beach and boulder stones, never seen before on that "coast; so that by this, and the pier decaying through want of "provision for its support and maintenance, and especially by "the poorer sort disorderly pulling the timber and iron in "pieces, which was not looked after; the harbour was so lost, "that a boat drawing but four feet water could not enter the "mouth thereof. Thus the decay of the haven at Dover, "and loss of Calais happening both about one time, made "such an utter desolation thereof, that of a brave, rich, and "populous town, it became presently a poor and desolate "village. But there remained a strong opinion of all men "for renewing the haven in that place."

"Queen Elizabeth therefore granted to the town of Dover, "towards repairing their harbour, free transportation of 30,000 "quarters of barley and malt, and 4000 tun of beer, free of "custom and impost. Besides, in the 23rd of Elizabeth an "Act passed for laying three pence upon every ton of any

"vessel passing by Dover, of twenty tons burthen and up-
"wards, for eight years, which tonnage amounted to £1000
"per annum. And 31st of Elizabeth, the former Act was
"revived to continue for seven years longer; and afterwards,
"35th Elizabeth continued after the time limited aforesaid
"till the end of the Parliament then next ensuing; and 43rd
"Elizabeth continued yet further, till the end of the first
"session of next Parliament; and 1st of James, from the end
"of that Parliament for seven years; after which time it only
"expired, having so many years enjoyed the benefit of so
"great assistance. By all which it is evident how it has been
"the immediate care of the Kings and Queens of this realm,
"and of the Parliaments thereof, to protect and preserve
"this harbour at Dover, tending so much to the honor of the
"crown, safety of the nation, and advantage of trade."

"1st. It is the principal seat of all jurisdictions within the
"Cinque Ports; the Courts of Chancery and Admiralty
"being constantly held there."

"2nd. It is the great storehouse of provisions for his Ma-
"jesty's navy, there being in this port one of his principal
"victualling offices for the fleet, when they shall be at
"sea. And in the late war was seen to be of great
"use and benefit to his Majesty's service."

"3rd. In time of war, the harbour of Dover is a great
"protection and safeguard to his Majesty's ships of the
"lower rate, when they find the enemy too strong for
"them at sea, and a great advantage at other times,
"when they may take the liberty to cruise the channel
"at pleasure, and secure their prizes in few hours; of
"which in the late war with Holland and France there
"was sufficient experience."

"4th. The harbour of Dover being in its situation the
"chiefest port in the southern part of England, between
"Harwich and Portsmouth, is of great importance to
"the ships of merchants in time of peace, where upon
"any accident of a leak, or other damages, they may
"presently put in here and be fitted for their intended
"voyage."

"5th. The customs of this port have in times of trade,

"before the late civil wars, (peculiar only to this port,) "amounted to £50,000. per annum."

"6th. His Majesty's frigates of 4th or 5th rates and under, "out of the Downs and Channel, may and have used to "come into this Harbour, and there victual, wash and "tallow, and go to sea again in a few tides."

"7th. This port is, and always hath been, a great nursery "for able mariners, and a proper station for pilots, to "conduct ships through all the sands and flats, either in "his Majesty's service or the merchants."

"8th That unless some speedy remedy be taken, to prevent "the present danger of the seas, not only the Harbour, "but the whole town is like to be inevitably lost, to the "ruin of many hundred families, and universal damage "of the nation."

"It is therefore humbly recommended to the wisdom of the "Parliament, to make such provision for remedy thereof as the "necessity of the work requires, and hath always been the "care of former times."

A STATEMENT RELATIVE TO DOVER HARBOUR, MADE TO KING CHARLES THE SECOND, IN 1682.

[FROM THE HARLEIAN PAMPHLETS, N°. 69; WHERE THE RELATER IS SAID TO HAVE BEEN SIR HENRY SHEARS.]

"This Discourse was part of a Memorial, which I found "amongst the rubbish of old papers while I had the honor to "serve in the office of the Ordnance, and was searching after "light into the ancient history and services of Dover: to "which curiosity I had divers motives, viz."

"I had made several essays to awaken his Majesty, "king Charles, out of the lethargy he seemed to me to be "under; upon the French king's so loudly alarming us by "the profuse expence he had been at, in fortifying his coast, "making artificial ports, and sparing no cost where he had "the least prospect of compassing a harbour and defence for "shipping, and improving his naval strength and projects; "which, to me, appeared as so many comets, whose malevo-

"lence was calculated, and could not fail, one time or other, "to fall on us. I had, in those days, frequent occasions of "privacy with the king in his closet, where I improved every "opportunity to warm his jealousy of the growing naval "power of France; and albeit, he gave me many a gracious "hearing, and seemed to take pleasure in my discourse on "that subject, and would often himself reason, with great "sagacity, on naval matters; yet I grew at length convinced, "that I laboured in vain, and had been all the while "blowing a dead coal, as by this short following account "may appear."

"In the year 1682 (waiting one day on the king in his "closet,) after some general discourse, his Majesty was pleased "to tell me, 'That I had often hinted to him, how busy the "French king was on his coast, and what vast designs he had "conceived for the improvement of his naval power; which "was visible by his fortifying of Dunkirk in a most expensive "manner, and projecting extraordinary works there; making "piers, channels, basons, and every provision that art can "suggest and money compass, to render that place easy of "access; and make it a safe, capacious, and commodious "harbour for shipping.' I told his Majesty, 'that not only "at Dunkirk, Brest, and other places, where nature and "situation had given them some help and encouragement to "prosecute their maritime projects; but even every where "else upon his coast, in every creek, cove, or inlet, where "they can make depth of water, and give the least harbour "and retreat for shipping they are, and have been, on that "article equally industrious; which (as I had often told his "Majesty) seemed to me to have a very evil aspect on all the "maritime states of Europe, but more especially his Majesty: "they have also built fortresses, raised batteries, and planted "cannons innumerable, and performed every wise and needful "work towards attaining their ends of becoming formidable "by sea; and all this against the grain, and as it were in "despite of nature, which yields them little or no encourage-"ment: whilst we on our coast (where providence is so "bountiful) have been so very little on our guard, that though "navigation be the prime jewel of the crown, and is the "fountain and foundation of both our wealth and safety, and

"without which we should be a contemptible nation, have not "only omitted to improve the tenders, which nature makes "us, for the increase and cultivating of our naval power; but "have, in this last age, consented to see many of our useful "ports run to decay, and at length to ruin, and to become "totally lost to the nation; which a very little foresight, and "as little charge, might have prevented, while the evil was "growing, which, at a long run, becomes incurable: among "which ports, I instanced Sandwich, Dover, Rye, Winchel-"sea, &c. which were reckoned heretofore, as so many bul-"warks against our ambitious neighbour.' The king hereupon "replied, 'that he confessed he laid a little to heart the loss "of the haven of Dover, because it has fallen to decay mostly "in his reign; had yielded him good service in the first "Dutch war; and in that which was made by the parliament "with that nation, he was well assured, that we had a squadron "of cruisers, which sailed out of that place, where they fitted, "cleaned, and victualled, which did the enemy more damage "than any in the whole channel beside; that, therefore if he "thought that haven could be recovered by any tolerable "charge, he was then, more than ever, disposed to engage "in such a work; inasmuch as he was well assured, that not "only all that I had said was true, but that the French king "(to whom though he had already signified, by his ambassa-"dor, that the great bustle, he made upon the coast, had given "jealousy and distaste to the nation, and was not very pleasing "to him) had nevertheless engaged very lately in a new "expensive work, of the same nature with those I had men-"tioned, in the neighbourhood of Calais, where great numbers "of men were then actually employed in fortifying the coast, "and making a harbour and bason for reception of shipping, "&c. which being just under his nose, he said, he had so "much the more reason to resent, and which he could not "do in a better manner, than by attempting the recovery of "Dover haven; wherein if he succeeded, as it would give "occasion of ease to the people's jealousy, so it would obviate "in some measure the danger that threatened us from so "restless and projecting a neighbour.' I replied to his Ma-"jesty with joy, 'that I thought it would be a most acceptable "instance to the nation of his care for their safety; and a

"useful proof to the murmuring people, of his just dislike "and suspicion of the French king's proceedings; and that I "was in no doubt, whenever his Majesty should appear to go "in earnest about so laudable and needful a work, that the "Parliament would frankly assist him towards the expense."

"His Majesty hereupon commanded me to make a journey "to Dover, to survey the port, and enable myself, by the best "means I could, to give him a true state thereof, in order to "a project for the recovery of that harbour: which order I "carefully executed, and on my return, waited on his Majesty "with my report, together with a plan and state of the present "pier; a history of the services that place had yielded the "crown; how it has fallen to decay; and how, with least "charge, it might be repaired and rendered useful again. "I told his Majesty, that the bare customs and duties he had "lost by the decay of that port, which, for want of entrance "into it, as had been customary, (there being no others in many "leagues together on the coast,) and which were, therefore, "now smuggled and totally lost, would be by many degrees "more than enough, when recovered, (and which would most "certainly accrue upon restoring the harbour,) to repay the "utmost charge he could be at for its repair and improvement; "which single encouragement, I thought, was incitement "enough to go about so noble, useful, and reputable a work."

"I told his Majesty that the port was, at that time, become "entirely useless, the pier within being filled and choaked up "with sand and mud, and the depth of water lost; that there "was a bank of beach at the mouth of the harbour of many "thousand tons, which barred up the entrance; that the town, "which was wont to abound in shipping, seamen, commerce, "people, and plenty of all things, was become poor, desolate, "and dispeopled, which was visible every where, by their "decayed buildings and habitations, where half the houses, at "least, throughout the whole town, had bills on the doors; all "which could be ascribed to no other reason than the decay "of their harbour; touching the true cause whereof, or the "cure, the inhabitants, with whom I had frequent conference, "could give me little or no light. In a word, I ended my "discourse to his Majesty with assuring him that Dover "promised every thing he could hope from such a port—was

"situated the nearest of all others to a great, dangerous, and "aspiring neighbour, who had given so many instances of "wisdom and foresight in the charge he had been at on that "line of his coast which confronts ours, and which, whenever "his Majesty should chance to have a war with that people, "would be found to turn every way, both offensively and "defensively, to marvellous account—that Dover stands on a "promontory which surveys, and might be made to command "the greatest thoroughfare of navigation in the world; where "no ship can pass unobserved, or escape the danger of being "attacked when there should be cause; and was of the same "use by sea, as a pass is by land; and that there was no "design his Majesty could entertain for its strength and "improvement, that was not compassable by art, and that did "not promise a plentiful return of profit and honour, of any "the greatest sum he could spare to lay out upon it."

"I departed at that time from his Majesty full of hopes that "what I had done and said on this subject, would have pro- "duced the good effect of some speedy resolution; but taking "the liberty some days after, to remind him thereof, I found "him (to my great disappointment) much calmer than I had "left him, and received this short answer:—'That it was a noble "project, indeed, but that it was too big for his present purse, "and would keep cold.' Shortly after, I was dispatched to my "business in a remote country and from that time to this, have "neither said nor heard any thing of Dover."

"If our forefathers in those darker times of Queen Eliza- "beth, saw a reason for their speculation on this article—then, "when their views were narrow, their motives less, and the "means to obtain that purpose hardly to be compassed, through "the limited funds of treasure in those days, and the insuffi- "ciency of undertakings to conceive, design, and prosecute "works of that sort—so magnificent, so new, and out of the "way of the world's practice; it may therefore be hoped for "now, when our motives of danger are so much greater, &c. "are so visible, and so much stronger—the means of obtaining "so noble an end, every way more within our reach—while "we behold by what arts and means, and with what profusion "of treasure, a neighbouring prince pursues his maritime "projects. And since we have seen and felt with what effect "he has succeeded in his aims to rival us by sea, and, in a

"word, while we know he must naturally ever be more than "our match by land, and that nothing, at this day, can insure "our safety, but a demonstrable superiority of naval strength, "what greater wisdom and precaution can we manifest, or "how can we more laudably publish our attention to the "public welfare, than by seasonably obviating the evils that "seem to threaten us by the growing naval power of France? "—towards which, no one step we can make, promises better "fruit than this proposal of recovering and improving the "haven of Dover, which is, by nature, situated to our wish, "and (in my humble opinion) is capable of being made, by art, "so useful to prevent and annoy our enemies, that, were the "argument duly weighed, I am persuaded, we should think "no sum too great to be so employed."

EXTRACT FROM A MEMORIAL OR PETITION, DRAWN UP BY SIR HENRY SHEARS, KNT. ABOUT THE YEAR 1700.

[FROM LYON'S HISTORY OF DOVER, VOL. 1, P. 177.]

"Sir Henry Shears, knight, in his petition, represented "the pier as choaked up with sand and pebbles, and so much "out of repair, that it would soon become useless to the "inhabitants, and to the nation, if something was not done "to prevent it."

"To shew that a harbour at this place was of importance "to the public, he mentioned, that, in the year 1652, a "squadron of ships, of the fourth and fifth rates, came in to "refit, and victual; and several of them sailed again the next "day. At that time, there were eleven feet of water at the "neap, and twenty-two at spring tides; and that Charles the "Second ascribed his successes at sea, to his ships using "Dover harbour."

"He further stated, that, in the year 1689, a fleet, of about "seventy sail of merchant ships, were driven into Dover "harbour, without anchors or cables, which must either have "been lost, or fallen into the hands of the enemy; and "several transports, in the year 1693, were saved, by seeking

"shelter in the pier; and if his Majesty had not, upon the "representation of Sir Cloudsley Shovel, and others, advanced "five hundred pounds, in the year 1698, the harbour would "have been entirely lost."

"To shew the great decrease of trade, in consequence of "the bad state of the pier, the petitioners said, formerly "£20,000 had been received at the custom-house for duties; "but, within the last twenty years, hardly any thing; and the "inhabitants were reduced to so low a state, that they could "not pay the ground rent due to the harbour, neither could "they get more than £150 a year."

"Sir Henry concluded his petition with saying, the Act of "Charles the Second produced no more than £9000; but he "was unacquainted with what sums had been received under "prior statutes, as their books were damaged; and such was "the state of the harbour, that it would require £30,100 to "repair it; but they might proceed if they could raise six or "seven thousand pounds a year."

EXTRACT FROM HARRIS'S HISTORY OF KENT, 1719.

"As to the famous Pier of Dover, I find by the Deering "Manuscript, that King Henry 8th laid out here above "£80,000 in that work: making a bulwark, which from "Archcliff ran far out into the sea to the eastward; and "hereby was gained much firm ground: in this he made "moats and bulwarks: and appointed officers and soldiers to "keep guard here. These had also the care of the Black "Bulwark: and had the profit of a crane, which then stood "near it, for the shipping and unshipping of goods. And it "appears by the charter of King James the 1st. that great "care was taken, and a vast expence employed, to make this "harbour good, and to keep it in repair, in the reigns of King "Henry 7th, King Henry 8th, and King Edward 6th. Dover "Pier was finished in 1585 by Queen Elizabeth's care; who "also laid out a great deal on the repair of the castle; and

"more than any other Prince but King Edward 6th. who "expended £10,000 in fortifying and repairing it."

"Sir John Thompson, Clerk, Parson of St. James's in "Dover, drew a draught, and made a proposition to the "King to repair the harbour; the King encouraged it; and "he first built a mighty wall, which he called the Pier, from "Archcliff Chapel, being the South-west part of the bay, "directly eastwards into the main sea, and of 131 rods in "length, leaving the entrance only at East-south-east."

"This Pier was began 1533, and was compiled of two rows "of main posts, and great piles of 25 or 26 feet in length, "which were let into holes hewn in the rocks below, and "some of them were shod with iron, and driven down into "the chalky ground. The King mightily encouraged this "work, and gave towards it above £50,000, and was several "times in person to view it. But afterwards, his absence at "the siege of Bullen, his sickness at his return, his dying, "and his son's nonage, put a stop to, and at last exposed to "decay and ruin this noble work. Queen Mary indeed "attempted to carry it on again; but neither the officers, nor "the workmen being well paid, it came to nothing. And in "process of time, the sea brought such quantities of beach "again upon it, especially about a fort on it, called the Black "Bulwark, that it drove quite through the piles, and choaked "up the Harbour, making a shelf of beach from thence east-"erly to the bottom of the cliff called Castle Bay; and this "ruin of the pier continually increased; both by the neglect "of repairing it; and also by the poor peoples' stealing the "wood and iron, &c. from it, almost every night. The shelf "also grew worse and worse every day, and there was no "getting over it, but in that place where the river coming "down from the town forced a passage into the sea; or till "they had dug a channel through it. This and the loss of "Calais about the same time, soon, brought Dover into decay. "At length this shelf became of itself a kind of defence "against the sea; and if ships could have got safe within it, "they might have rode there in safety."

EXTRACT FROM "THE CASE OF DOVER HARBOUR, 1756," (THEN PUBLISHED WITH AN INTENTION TO BE LAID BEFORE PARLIAMENT.)

"This harbour is the only commodious harbour on the "southern coast of this kingdom; there not being any other, "any way considerable, between Portsmouth and Harwich; "and is of very great importance by its situation; for as the "great trade of this kingdom is to the southward, and there "is no other considerable harbour in all that distance, in case "any ships or vessels in the Downs (where great fleets usually "ride, and which is but six miles from Dover) or in the chan-"nel thereabouts spring a leak, or come to any damage "through stress of weather, or otherwise, they may come into "this harbour and be repaired, and proceed on their voyage; "whereas, otherwise, they must be forced to go up the "river, oftentimes to the overthrow of the voyage: and many "times the exigence is so great, that this harbour is the only "means of preserving ship and goods, and the lives of many "persons, that would otherwise be lost; of which there are "numberless instances, particularly in a great storm in January, "1689. Between 30 and 40 sail of ships, some of them very "richly laden, for the Straights, Portugal, and the West "Indies, were forced to sea from the Downs, and got in here "in safety; which more might have done (that were drove "away upon the French coast, and many of them there lost) had "this harbour had that improvement made in it which it is "capable of, and which nature itself points out. And of those "ships that were saved, several must inevitably have perished, "by the damage they had sustained, if they had not been "preserved by this means. And in November, 1684, an "extraordinary storm happening, when a great fleet was in "the Downs, above 100 sail were secured by coming in here. "And many more such like instances there are, which it "would be too tedious to mention here; for there is hardly a "winter passes without instances of this kind. And for the "preservation of such ships, as may be obliged to come in "there, and cannot safely take the ground, it hath a con-

"venient bason, in which ships of 300 tons burthen may "constantly lay afloat."

"This harbour is also of very great importance by its "situation, in the narrowest part of the Channel between "Great Britain and France; for the greatest part of the "trade of this kingdom lying that way, in time of war, mer- "chant ships in case of danger from the enemy, may put in "there, and be secured. And it may, and hath been a great "annoyance to the enemy, as His Majesty's frigates of the "4th and 5th rates, and under, lying in the Downs, or plying "about the Channel, may and have used to come into this "harbour, and there wash, tallow, and victual, and to return "to sea again in a few tides; by which means much hazard, "time, and expence, by going up the River, is saved, and his "Majesty's service much promoted. And to this King Charles "the Second attributed much of his success in his Dutch "wars. And here let it be observed, that his Majesty's frigates "coming in there and victualling, may oftentimes be of very "great consequence, when, for a great while together, the "weather is so rough, that no victualling vessels can lay along- "side of them in the Downs, to put provisions on board of "them."

"From this harbour also small vessels, which dare not "always keep the seas, may go out and in, and take the "advantage of the enemy's vessels going through the Chan- "nel, and bring in, and secure their prizes; of which the last "war afforded very plain proof, this harbour being then the "rendezvous of all the privateers upon this coast, to the "number of 25 and upwards: by which means the trade of "this kingdom was greatly protected, and the Channel cleared "of the enemy's privateers; and it then had in it, at one "time, above 100 sail of captures from the enemy; and of "such captures and other ships together, between 2 and 300 "sail; of which two were of the burthen of 500 tons each, "and upwards; and of the rest, much the greatest part were "from one to 500 tons burthen; and it hath now in it "upwards of 50 sail of captures from the French, several of "which are of considerable burthen."

"This harbour is of farther importance, by being the "station of his Majesty's packet boats to France and Flanders,

"and by having a convenient and useful office for victualling "his Majesty's navy, and a well established society of skilful "pilots."

"King Henry the 8th, being sensible of the advantage of "this situation, and that it was by nature formed for it, did at "first found a harbour there, at his charge of £60,000. "The same was afterwards repaired in the reign of Queen "Elizabeth, by a duty of three pence per ton, laid by Parliament, "on shipping; and again in like manner, in the reign of King "James the 1st, and from that time it was repaired by "several allowances by the government, till the year 1700; "when, being very much gone to decay, and in great danger "of becoming totally useless, a duty of three pence per ton "was again laid on shipping, for the repair thereof; but in "the year 1723, two-third parts of the said duty were taken "from it, and appropriated to the making a harbour at Rye; "with what success must be left to those to say who have "seen it; and with this one penny per ton, which is only "one-third part of what was granted in the reign of Queen "Elizabeth, when the value of money was so much higher, "and materials and labour so much cheaper, has this harbour "been brought to its present usefulness; which, if it belonged "to the French, would be thought of the utmost consequence, "and long ago have been improved to the utmost; for great "is the improvement which it is by nature capable of; even "of being made the very best tide-harbour in Europe; it "having, besides many other advantages, a constant supply "of back-water; but the present duty being so small, and "deeply mortgaged for the money laid out in bringing it to "its present condition, those improvements cannot be made "without further provision by Parliament; for which it is "hoped the merchants, (considering the great usefulness of "the said harbour) will countenance. In short, nothing is "wanting to induce the nation to make those improvements, "but the informing themselves truly of the advantages of its "situation, and how capable it is of being improved, and at "how small an expence (in comparison with the usefulness "thereof) by causing the said harbour to be surveyed and "examined by proper persons."

EXTRACT FROM A PETITION OF THE CHEESEMONGERS' COMPANY OF THE CITY OF LONDON, TO THE HOUSE OF COMMONS.

[FROM THE BRITISH MUSEUM.]

"The Cheesemongers of the city of London, are considerable traders, and have built above twenty ships or vessels, to bring cheese from Liverpool and Chester, for the service of the city of London, and places adjacent; and generally make three voyages in one year, with each ship, which by Act of Parliament made on the 11th and 12th of King William the Third, they are obliged to pay three pence per ton, towards keeping Dover harbour and pier in repair, as coasters once a year.

"That most of the said Cheesemongers' ships load back to Dublin, and other parts of Ireland, which being back carriage, the freight is very small for which they are obliged to pay three pence per ton every voyage, as foreign ships, notwithstanding the yearly payment: so that most of the said ships pay toward the said harbour, twelve pence per ton in one year, to the great discouragement of the said traders.

"That the said Cheesemongers' ships, paying every voyage at Liverpool a considerable duty for the making a dock, and repairing and maintaining the harbour; all which is done at the sole charge of such ships as came into the said port.

"The Cheesemongers having petitioned this Honourable House, and humbly pray (as they never did, and do believe they never can receive any benefit by the pier or harbour) that a clause may be inserted in the bill now depending, that their ships may be exempted as well as others are, that maintain harbours and piers at their own charge."

EXTRACT FROM A LETTER OF SIR T. K. PAGE, KNT. F. R. S. TO THE MILITARY ASSOCIATION OF THE TOWN OF DOVER, DATED MARCH 18th, 1784.

"The great advantage that might arise from Dover harbour

"to his Majesty's ships employed in these seas, in times of war, "and the necessity, as the forces of our enemies increase, "of using every possible means on our part to augment the "navy of this country, cannot fail to interest every good "subject in the success of all proper endeavours to improve "a place capable of affording the greatest benefit to our "marine; the practicability of which, and the means of draw-"ing infinite advantage, both with respect to men of war and "trading ships, being well known to every common under-"standing."

CASE OF DOVER HARBOUR,
DRAWN UP ABOUT THE YEAR 1807.

"By an Act of the 11th and 12th William the Third, "1700, which recites the importance of Dover harbour, and "that by long experience it had been found of great use "and benefit to shipping passing through the narrow seas and "otherwise, a duty was granted for the maintenance of 3d. "per ton on all vessels from 20 tons and upwards to 300 tons "for every loading or discharging for, from, to, or by Dover, "(except ships laden with coals, grindstones, Purbeck or "Portland stones,) and for every chaldron of sea coals or "ton of grindstones 1½d. These duties were continued by "subsequent Acts under the 9th George the First, 1723, "when two-thirds were taken from Dover, and appropriated "for the purpose of making a harbour at Rye, and they "continued thus divided until the 31st George the Second, "1758, when it having been found that the reduced duties "were not sufficient for the support of Dover harbour, one "half of the original duties was restored to it. In the latter "proportions they continued until 1797, when it having been "found wholly impracticable to make a useful harbour at "Rye, the project was abandoned, and the half of the duties "appropriated for that purpose, and which had been with-"drawn from Dover, wholly ceased.

"The consequence to Dover harbour, by being thus de-"prived of its ancient revenue, was, that it has been ever "falling into decay, its reduced income being inadequate to

"its support. There is an existing debt on mortgage of the "tonnage duties of about £9000; and the situation of the "South pier head, notwithstanding the temporary repairs it "has from time to time for many years past undergone, is "such as now to require a complete new pier head to be built, "the estimated expence of which is £25,000 and upwards; "but the actual expence will be considerably more.

"The perilous situation of the South head is so notorious "and alarming, that at a public meeting some time since, of "the inhabitants, and more particularly of the pilots and "seafaring men of the town, whose knowledge, and daily "observation of the harbour, and whose experience of the "effects produced on the pier head by the strong South-west "gales, which roll in with prodigious fury, qualifies them to "be competent judges on the subject, it was clearly stated "and proved that the piles, with which the present head is "constructed, are so worn away and decayed at their founda- "tion, that the body of it has bulged out and partly sunk, "and the most serious and well-grounded apprehensions are "entertained, that unless a new pier head is built without "delay, the present one will be wholly swept away by the "sea; the consequence of which will be, that the harbour "must in a few tides be choaked up, and filled with such a "body of beach, as could not be removed, but at an immense "expence and labour; and as that would be a work of consi- "derable time the harbour during the interval would be "wholly lost to the public. This representation of the pilots, "&c. being made to the Warden and Assistants of the harbour, "they ordered a survey by Messrs. Rennie and Wilson, "eminent civil engineers, whose report fully corroborated "their statement and apprehensions.

"The national importance of Dover harbour, cannot be "doubted, when it is considered, that it is the only port of "shelter between Ramsgate and Portsmouth; and its great "utility in affording shelter to dismasted and distressed ships, "when driven out of the Downs by gales from the North and "Eastward, can be most satisfactorily proved in numberless "instances, in many of which the distressed vessels could "never have reached Portsmouth; and but for Dover harbour "must inevitably have been lost.

"Its general utility will appear from the following state-
"ments, prepared from authentic documents of the vessels
"which have entered Dover harbour during the last seven
"years.

1st Jan. 1800, to	From 50 to 100 tons.	100 to 200 tons.	200 to 300 tons.	300 to 400 tons.	400 to 500 tons.
1st Jan. 1801	366	66	2	0	0
1801 to 1802	419	64	12	5	0
1802 to 1803	543	43	5	1	0
1803 to 1804	523	62	13	2	0
1804 to 1805	488	52	7	1	0
1805 to 1806	363	62	30	2	1
1806 to 1807	470	112	29	4	2

"This statement does not include revenue, victualling, or
"ordnance vessels, H. M. cruisers, or any vessels belonging
"to Dover.

"The present Tonnage Duty Act for the support of Dover
"harbour will expire on the 1st of May, 1807; and in order
"to enable the Warden and Assistants to borrow a sufficient
"sum to rebuild the South pier head, on which the existence
"of the harbour depends, it is intended to make an applica-
"tion to Parliament, to restore its ancient revenue, as granted
"by the Act of King William, making it however a port
"charge; and when it is considered that the money to be
"thus raised, is not to be expended on speculative projects,
"but in a work of absolute necessity, on which the existence
"of a useful harbour depends; and that the duty is to be
"confined to such vessels only as it is capable of affording
"shelter to; and not, as in the Ramsgate Act, to be extended
"to all vessels without limiting the tonnage, it is conceived
"that the measure will meet with the concurrence and
"support of the shipping interest of the country."

EXTRACT FROM VIRTUE'S PICTURESQUE BEAUTIES OF GREAT BRITAIN, 1828.

"Under the superintendance of the Commissioners, the
"works and improvements of the harbour have been carried
"on, and Acts of Parliament obtained in every succeeding
"reign, to confer greater force to their proceedings. In the

"course of the eighteenth century, several jetties were erected "eastward, to prevent the encroachments of the sea; and "although the strong south-west winds, so frequent at Dover, "threw up large quantities of beach at the mouth of the "harbour, the sluices have been constructed in such a man- "ner that with the aid of the back-water, they often clear it "in one tide. This harbour is, however, still capable of great "improvement; and if we consider the important benefits it "is capable of producing in times of hostility with the northen "powers, when numerous ships of war are stationed in the "Downs, it seems surprising that this haven has not been "sufficiently improved, so as to render it a station calculated "to receive some part of the royal navy of Great Britain."

EXTRACT FROM A MODERN PUBLICATION,

PRINCIPALLY SELECTED FROM HOLINSHED'S CHRONICLE.

"During the reigns of Henry the Seventh and Henry the "Eighth, a pier was commenced, extending 131 rods eatsward "from Archcliff fort into the sea, or about 20 rods farther "out than the present south pier head. In consequence "of this projectment, increasing masses of beach and sand "had accumulated across the bay, forming at first a bar or "mole, and ultimately an impassable barrier to the direct "course of the river into the sea. Thus the river being "diverted from its fomer course, glided down behind these "mounds of beach into a harbour formed in Paradise Pent."

"Henry the Eighth expended more than £63,000 in "constructing his "migthy pier," as it was called; and queen "Mary granted letters patent to collect money throughout "England to complete or repair it."

"In queen Elizabeth's reign, which commenced in 1558, "the works of the harbour were in a dilapidated state, and "she was anxious to repair them."

"For this purpose she granted to the town the free "exportation of 30,000 quarters of wheat, &c. This appears "to have been insufficient; and in 1580 she granted to the

"harbour 3d. a ton on every vessel, whether loading or "unloading in any port within the realm, for seven years; "and 1½d. for every chaldron of coals, and the same for "every grindstone landed for sale."

"The lord high admiral inspected the harbour in 1581; and "the old mariners could then remember when the sea washed "the cliffs in Snargate-street; and they informed his lordship "that no beach had collected in the bay till the wall or pier "was built on the west side of it, from Archcliff-fort."

"Before the end of the year, a violent storm made several "breaches in the pier; the entrance at its extremity was "choked up, and the harbour in Paradise pent was filled "with mud and beach."

"To remedy these defects, the present great or upper "pent was formed."* "A wall, called the Long-wall, was "extended 120 rods from a point near the present York "Hotel, in a line not far from the carriage road behind "Waterloo Crescent, to a point above the water-gate, or "where the river now empties itself into the pent: conse- "quently this point must have been near the western extre- "mity of Liverpool Terrace. Another wall, called the Cross- "wall, was extended 40 rods from the same point near the "York Hotel, in a line with the present Union-street, to the "foot of the cliff."

"The sides of the walls were raised with slime or mud "intermixed with beach, and covered with faggots, similar "to the sea walls at Dymchurch, in Romney marsh, and the "middle was filled up with chalk. The long-wall was 70 "feet wide at the bottom, and 40 at the top; and the cross- "wall, 90 at the bottom, and 50 at the top."

"The work was commenced on the 13th of May, 1583, with "only six carts; but on the 27th of the next month, there "were 542 carts, and nearly 1000 workmen. A man with a "horse and cart, had 1s. a day, which was so ample at that "time as to induce many to come from Maidstone and "Sevenoaks to assist. The whole, which was expected to "require three years, to the astonishment of all, was completed "in three months, and cost only £2700. Holinshed gives an "interesting detail of the proceedings, and passes very high

* See plan of Dover in the reign of Elizabeth.

"encomiums on the patriotism and diligence of those who "devised and completed a project so useful and beneficial to "the public. He says the work was so compact that not the "least leakage was perceptible."

"A sluice and gates were constructed near the site of the "present Union Hotel, from whence a channel (since covered "by the houses on the western side of Strond-street) led to "the Paradise harbour. This was the only passage for vessels "into the upper or great pent. At the lower extremity of the "Paradise harbour, where Mr. Ismay's premises have since "been built, was another sluice and gates, and a storehouse "adjoining them with her Majesty's statue in front. The "water issued through this sluice to disperse the beach at "the entrance by the pier."

"In 1597, a new double sluice, eighty feet long, sixteen "wide, and thirteen deep, was constructed where the bridge "is now placed. The water from this sluice, after passing "through the present basin, which at that period formed a "part of the outer harbour, rushed on to remove the beach at "the entrance by the Black Bulwark. This rendered the "passage through the Paradise harbour useless, and it was "soon filled up, and the harbour deserted."

"The lower Cross-wall, on which a clock is now erected, "was constructed, and the ground excavated, in 1661, to "form the large basin between this and the former, or upper "Cross-wall; but it was not faced with stone, nor a bridge "furnished for foot passengers till 1737."

"From this period the general outline of the harbour was "suffered to remain unchanged till 1813, when a part of the "outer harbour was enclosed by a wall to form a basin to "supply the present tunnels; and a dry dock was constructed "in a part of it."

"A MEMORIAL OF THE MAYOR, JURATS, AND "COMMONALTY OF THE TOWN AND PORT OF DOVER, TO "THE HONORABLE THE WARDEN AND ASSISTANTS OF "DOVER HARBOUR:—

"Sheweth,

"That during the present winter the accumulation of beach "at the mouth of the harbour has increased to so alarming an "extent that numerous vessels in distress have been unable "to effect an entrance, and the communication between "Dover and the Continent by His Majesty's packets and "private vessels has been frequently interrupted, thereby "occasioning a great and serious loss to the inhabitants of "Dover, and more especially to its trading interests, and an "inconvenience and expence to all persons crossing the "channel.

"That since the late war, the attention of the most skilful "engineers having been directed by successive governments, "to the state of the various harbours in the United Kingdom, "and the same system having been pursued on the opposite "coast, that practical experience has been acquired which "in the hope of your memorialists, may enable such measures "to be suggested as may lessen, if not altogether remove, "the evil complained of; an object the attainment of which "is of the highest importance to the town, and, from its "local situation, to the national shipping and commercial "interests of the country.

"Your memorialists therefore most respectfully request "that, from the urgency of the case, your honorable Board "will be pleased to give the subject your earliest and best "attention, and to adopt such measures as may upon consi-"deration be deemed most advisable.

"In witness whereof your memorialists have caused their "common seal to be hereunto affixed, this 17th day of Janu-"ary, 1834.

A true copy of the original memorial,
LEDGER, Town Clerk of Dover.

"TO THE KING'S MOST EXCELLENT MAJESTY.

"THE HUMBLE MEMORIAL OF THE INHABITANTS OF THE "TOWN AND PORT OF DOVER, IN THE COUNTY OF "KENT, IN COMMON HALL ASSEMBLED,

"Most humbly sheweth,—that we, your dutiful and "loyal subjects, the undersigned merchants, ship-owners, "tradesmen, and inhabitants of this ancient town and port, "approach your Majesty with the most unfeigned and heart-"felt declarations of loyalty and respect for your sacred person "and character, earnestly soliciting the aid of your powerful "interference and support towards the improvement of the "harbour of this town."

"That your Majesty's predecessors and ancestors, Kings "of England, have at all times acknowledged the usefulness "and importance of this port for all national purposes, during "peace, as a post-office packet station; and in consequence of "the safety and protection afforded to ships in distress, or "waiting for favourable winds; and in time of war, as a naval "and military depot from its proximity to the continent, ren-"dered still more worthy of serious consideration since the "introduction of steam into navigation."

"That a charter of incorporation was granted by his late "Majesty King James the First, to the Lord Warden of the "Cinque Ports, and ten Noblemen and Gentlemen resident in "the county of Kent, including the Mayor of Dover for the "time being, for carrying on the public works connected with "their said harbour; but notwithstanding the various remedies "heretofore suggested, their whole efforts have not yet met "with that success which it was hoped they would have "obtained."

"That owing to the prevalence of strong gales from the "south-west, the shingle forming the boundary of the British "Channel on this part of the coast, accumulates at times to "such an extent at the entrance of the harbour, as for the last "few weeks to close the same against all ships and vessels; "thus depriving them for a time, when most needed, of that "great protection and accommodation the harbour is known "to possess."

"That your memorialists have attended with great patience

"and expectation the execution of plans of late years, devised "for obviating the evil complained of; but after several sea- "son's trial, the same are found by no means adequate to meet "the evils they continue to sustain."

"That your memorialists, viewing the losses and injuries "not only they themselves, but also the nation at large, have "and do still sustain, by ships and vessels in public and private "employ, not being enabled at all times to take advantage of "the desirable and unrivalled shelter in tempestuous weather "this harbour is capable of affording; and being aware of the "extraordinary improvement in mechanical science which has "been made of late years, your memorialists are naturally "anxious that the Government should be appealed to, that "their powerful co-operation should be called in through the "medium of their engineers, practically skilled in surveying "harbours and the British coasts, for the purpose of suggesting "remedies for so injurious an evil, in furtherance of the "wishes of the inhabitants and assistance of the Honorable "Commissioners who direct the affairs of their harbour."

"Your memorialists bearing in mind the feelings and sen- "timents so often expressed by your Majesty towards this "ancient and loyal town, trust most earnestly and faithfully "that the prayer of this memorial will meet with that serious "consideration which, in a local and national point of view, "its merits may well deserve."

"And your memorialists, as in duty bound, will ever pray "for your Majesty's health, happiness, and glory, &c. &c."

"Dover, Jan. 17th, 1834."

"TO THE HONORABLE THE WARDEN AND "ASSISTANTS OF DOVER HARBOUR."

"THE HUMBLE MEMORIAL OF THE UNDERSIGNED INHA- "BITANTS OF THE TOWN AND PORT OF DOVER, IN THE "COUNTY OF KENT, IN COMMON HALL ASSEMBLED,"

"Sheweth—That your memorialists again approach your "Honorable Board with the most sincere and unfeigned "respect, and declare their implicit belief in your general

"desire to further the improvement of this harbour and the "interests of the town."

"That it is with the greatest reluctance your memorialists "are again compelled to call the attention of your Honorable "Board to the recent and present deplorable condition of "Dover Harbour, which, during the late gales from the south-"west, has been repeatedly blocked up, and rendered totally "inaccessible to ships and vessels of every description, the "accumulation of shingle running completely across the en-"trance from the south pier to the north pier, to the average "depth of twelve feet."

"Your memorialists having these injurious facts before "them, and considering the immense loss that the merchants, "ship-owners, tradesmen, and inhabitants have sustained and "continue to suffer, the great inconvenience under which the "trade in general is labouring with the great detriment to "public service, the continued impoverishment that is felt "by the inhabitants of the Pier district of the town, whose "main dependance is upon the shipping entering the port, "and the further depreciation of the property leased by your "Honorable Board, and the consequent diminution of the "revenue occasioned by vessels not being enabled to enter the "port, are subjects which induce your Honorable Board to "conclude that an urgent necessity exists for again pressing "this subject on your serious and deliberate consideration, "with a view to remedy the injury complained of without "delay."

"That many of your memorialists have witnessed the "various plans suggested and carried into effect of late "years, and more especially the culverts at the south pier "head; and although some relief is obtained thereby, it has "been proved by the incontrovertible evidence of the present "state of the harbour, that the same are by no means ade-"quate for remedying the evil complained of."

"Your memorialists are aware that the evil complained of "has existed from the first formation of Dover harbour, but "they conceive that it by no means follows that a remedy is "not at hand—indeed the advanced state of science, together "with the increased facility of procuring the means for prose-"cuting works of public utility, render such an undertaking

"as that of the improvement of Dover harbour much less "formidable than formerly."

"Your memorialists are not disposed to call in question "the measures that have hitherto been adopted to effect the "object, but it is too notorious that the object in view has not "yet been attained—your memorialists therefore feel it to be "a duty they owe to themselves and to the nation, from the "increased annoyance that has lately taken place from the "accumulation of shingle as before described, to urge that "some efficient measures be forthwith adopted to remove the "cause of complaint."

"Your memorialists will not presume to dictate to the "Honorable Board any course of proceeding, but beg to "refer to the opinions given by the various engineers who "have been consulted on this subject, namely:—

"John Clerk, who, in the reign of Henry the Seventh, "first raised a bank or wall to break off the effects of the "south-west wind."

"Henry the Eighth, 1533.—Sir John Thompson extended "the works forty-nine rods."

"Queen Elizabeth.—Poins, a Flemish engineer, extended "the work on the north-east with a groin."

"Queen Elizabeth, 1594.—Thomas Diggs extended the "piers further into the sea, where they have continued with- "out any further extension to the present time."

"1718—Captain Perry, engineer, recommended the south "pier to be carried out 150 or 200 feet beyond the north "pier head, and groins made to stop the pebbles from the "westward."

"1769.—Mr. Smeaton recommended that the south head be "carried out 90 feet, to terminate in a point."

"1782.—Mr. Nickalls recommended the piers to be "carried out 200 feet, which will cause the pebbles to be "drawn into deep water."

"1802.—Messrs. Rennie and Walker recommended that "the south head be carried 200 feet beyond the north head."

"1812.—Mr. Walker recommended that the south head "be carried out to low water mark; that the pier be built "with stone with a round head; that the canal be carried in it. "This plan was approved by Joseph Huddart, Esq."

" But without presuming to give any opinion on the above " recommendations, we, your memorialists, considering the im- " portance of Dover Harbour as a station for his Majesty's " Post Office packets in time of peace, and as a naval depôt in " time of war (rendered more worthy of consideration for na- " tional purposes, since the introduction of steam in navigation) " from its proximity to the Continent, earnestly pray and im- " plore your Honorable Board will send down immediately " one or more engineers of acknowledged talent and of mari- " time experience, to survey and report on the evils above- " mentioned, and to suggest remedies for the removal thereof, " That by your zealous exertions, assisted by the opinions " thus obtained, we, your humble memorialists, may have to " acknowledge the great service rendered to this town and " nation at large, by an improvement made to the entrance of " this port, thus raising this otherwise safe and commodious " Harbour to the rank and consideration to which, from its " locality and importance, it is entitled.

" And your memorialists, as in duty bound, will ever pray, " &c. &c. &c."

" Dover, Jan. 17th, 1834."

EXTRACTS

FROM

THE REPORTS OF ENGINEERS,

RECOMMENDING

THE EXTENSION OF THE SOUTH PIER, &c.

WHICH RECOMMENDATION HAS NEVER BEEN ADOPTED.

EXTRACTS FROM A REPORT ON DOVER HARBOUR, BY CAPTAIN JOHN PERRY;

ADDRESSED TO THE RIGHT HON. LORD AYLMER, 1718.

" My Lord,

" In obedience to your Lordship's commands, I have been " lately down, and carefully surveyed the port of Dover; and, " to the end that the observations which I have made, and " what I shall propose for the amendment of that harbour, " may be better apprehended, I shall first take notice of the " inconveniences and disadvantages that now attend it, to- " gether with the deficiency in all the designs or attempts " hitherto made to remedy the same.

" The great evils, which are complained of, and known to " attend that harbour, are, that when the wind blows hard " from the sea, towards the south and south-west, it causes a " great drift of the ballast or shingle to set along the shore, " which lodges before the pier, and chokes up the mouth of " the harbour, so that no ships or vessels can enter, until the " wind or weather changes; and that there is time and oppor- " tunity to clear the mouth of the harbour, by the methods " they now practise for it: and though this does not happen " so often as is reported, yet the very *notion* and *apprehension* " of it deters men (especially when the wind blows any thing " strong from the sea) from attempting to put into a port,

" where they are not *certain* of the true depth of water at " the entrance, to bring them into safety. There is now ordi- " narily not above ten foot water over the apron, or cell of " the gates, belonging to the entrance into the basin upon a " neap tide. Although there were a better depth of water " possible to be made, yet there is *so little room* in the present " basin, that it is generally pretty well filled with lesser ves- " sels, and not capable of entertaining both them and any " considerable fleet of others. So that through these several " inconveniences it is, that no ships of large burthen, and but " very few of lesser depth of water, in comparison of what the " harbour is *easily capable* of being improved to, can now " practise the coming in and out of the port, &c."

" Having thus mentioned the several disadvantages which " attend this harbour, I shall now offer my humble opinion " for the remedy thereof. And, as to the obstruction at the " entrance into the pier, I propose, in a more strong and " effectual manner to carry it out, on the west side of the " entrance, into the harbour, *at least* 150, *or* 200 *feet farther* " *into the sea*, than has ever yet been done, extending more " into deep water, and into the stronger course of the current, " as it sets along the shore. As to the eastermost pier, I " would not carry that much farther, or rather let it remain " as it is, until time shall shew the practice of running in and " out with *one pier only;* which, I believe, will be sufficient " for it, there being not known any beach to annoy or choke " the harbour by any drift from the eastward; which, as I " remember, I was informed by the pilots belonging to the " port: and, when there is only one pier carried out it will, " as I take it, *be the less dangerous for ships, which have* " *been known to suffer by missing the entrance, and being* " *cast, by the force of the tide, against the east pier.* " But if the westward pier be made of a greater length, and " a ship when the wind hangs westwardly, by the force of " the tide that runs athwart the pier, should be thrown a little " too much to the eastward, that she cannot luff up again, " when the wind hangs westward, as aforesaid, she may " instantly let go her anchor; or, if warps with buoys, for " that purpose, are fixed at proper places, ships may, by " taking hold of them, easily warp in or out *under the slack*

"*or eddy of the pier*, the course of the tide along the coast "being known always to set to the eastward, from the half "flood to half ebb: and that ships may, with more conveni- "ency, take hold of such buoys, they may have hooks fixed "to the strap, to receive the bite of the rope being cast from "any ship. And a farther reason why I propose a single "pier, for the present, to be carried out to such a distance, "is, that I believe the harbour will be thereby freed from "being choked up any more *for ever*, by the means of any "drift of the beach. But as I shall hereafter propose a much "larger quantity of water to be penned up in the harbour, "than has ever yet been; so, if ever it should happen, that a "small matter of beach should at any time lodge, it will be "much easier to spare water for the scouring it away; and "the observations that I ground my opinion upon, are these "that follow:—

"I have been informed, both by the Commissioners, whom "I had the honor to wait on at Dover, and by many of the "pilots, as wall as by gentlemen of understanding, inhabitants "of the town, that some years since, within their memory, "there fell down a cliff of chalk, or rocks, some distance to "the westward of the town; and by its fall, shot itself into "the sea, and lay upon a slant above the surface of the beach, "from high to low water mark, by which accident the beach "became wholly stopped for many years from driving along "the coast; and during all such time the mouth of the har- "bour was entirely free from being choked up, until the "beach, by means of the said cliff lying far to the westward, "began to wear quite away from before the town; and the "inhabitants thereupon became apprehensive that there was "danger of the sea's washing away, not only the beach, "(which there was no small jetties made to support and pre- "vent,) but even of wearing away the bank, and breaking "through the walls of the basin: they therefore, through this "apprehension, blew up and levelled the said cliff, and let "the beach come on again to the harbour's mouth as before, "and which now lies under the disadvantage of being fre- "quently choked up thereby.

"Another instance of the same kind, which I was also

"informed of, is, that there lately happened another cliff to "fall down into the sea to the *eastward*, just under the foot "of the Castle, which continued several years to lie above "the surface of the beach: and that it was very remarkable, "*the beach was thereby wholly stopped from being driven at* "*all to the eastward, but gathered and lodged wholly between* "*the said fallen cliff and the mouth of the pier, until the cliff,* "*by the operation of the waves of the sea, was washed and* "*worn level, or equal with the surface of the beach; and* "*that the beach, in bad weather, now wears away again* "*from out of the bay to the eastward of the pier, and rolls* "*on towards the South Foreland, as it did before.*

"These two instances of accidental causes which have hap- "pened, I think may give sufficient ground for a strong pre- "sumption that if an artificial jetty be built out to a further "distance than what was occasioned by either of the aforesaid "accidents, no beach will pass the same so as to subject the "entrance of the harbour to any annoyance thereby; espe- "cially if low snug jetties or break-waters are built in two "or three places to the west of the pier, and five or six to the "eastward, extending nearly as far as the foot of the castle: "which small jetties may be easily made with no very great "charge in the doing.

"Thus, my Lord, I have laid down my humble opinion of "the improvements this harbour is capable of, the perform- "ance of which will not only prove advantageous and agreeable "to such ships as shall pass this way, but extend to the com- "mon benefit of the kingdom in general.

"For it very often happening that ships are obliged to lay "a month or six weeks wind-bound in the Downs, besides "the common wear and loss of their ground tackle, it is too "well known that there is more riches frequently lost in one "storm by merchant ships being driven from their anchors in "the Downs, than would make this a common place of safety "for a very considerable number of such ships."

"And your Lordship can best judge how great an ex- "pence would be saved, and what advantages would accrue "in time of war, by making this a port covenient for cruising "ships."

"Submitting the whole to your Lordship's judgment and "favour, I remain, with my utmost duty,

My Lord,
Your Lordship's most obedient,
And most humble Servant,
J. PERRY.

"Note. This Report or Proposal for the bettering of the Port of "Dover, I found amongst my Father's Papers since his death, "signed by Captain Perry; which, at his request, I have returned "to him this 12th of October, 1720."

"AYLMER."

EXTRACTS FROM SMEATON'S REPORT ON DOVER HARBOUR, 1769.

"This Harbour appears from old accounts to have been a "national object for ages past, as being the nearest port, and "consequently, from its situation, the key between England "and France. On this account great sums of money have "been from time to time expended in keeping it open, and "rendering it as commodious as the nature of the situation "will admit of; yet, notwithstanding every endeavour for this "purpose, it still labours under some natural inconveniences, "which it is greatly to be wished were removed. For this "purpose, at the desire of the Right Honorable the Earl of "Holdernesse, Lord Warden of the Cinque Ports, I went "down to view and examine the Harbour of Dover in Feb-"ruary last; where I had every assistance the place would "afford."

"The port of Dover has in length of time gone through "many changes, the mouth or entry thereof being at present, "in a very different place to what it was within the compass "of record, as appears by accounts thereof collected by Mr. "Hammond, of Dover, with the perusal of which he was so "obliging as to favour me. This great change has been evi-"dently brought about by the same cause that has at all times "been, and still continues to be, its greatest annoyance; viz. "the constant motion of the beach or shingle, which by the "action of the sea, is driven coastwise, from west to east:

"for as the British Channel opens to the west, and contracts "to the eastward, the seas are much more violent and heavy "from the south-western than from the south-eastern quarter; "and in consequence, though it may be apprehended, that on "violent storms at south-east, the shingle may in some degree "be moved westward, yet, the general prevalence being the "contrary way, the most apparent and observable motion is "coastwise from west to east."

"This beach has formerly been the destruction of the old "harbour; and it appears from the above accounts, that the "mouth has been more than once entirely shut up, and has "remained so for years; and that the mouth of the present "harbour was originally a cut through the beach, to let off the "land-waters pent up in the inside of the harbour, in order "more effectually to view and examine the state thereof, and "to enable the engineers to construct such fresh works, as "might appear necessary for the re-establishment of the "harbour."

"According to this disposition, when by hard gales of "wind, and seas from the south-western quarter, a quantity "of beach is brought round the western head, and lodges itself "between the heads; the basin and pent are then filled, "partly by taking in the sea water, and partly by fresh water "afforded by the river, and there retained till it be low water. "The draw-gates of the sluices in the cross-wall are then "opened with all possible expedition, and the body of water "contained in the basin and pent, by making its way between "the pier-heads, cuts down and removes the bar of beach, "which at the time of spring-tides, is done with so great "effect, that at one single operation, as I am informed, a "good passage is opened for vessels; and at two tides the "whole mouth of the harbour can be cleared; and could this "be done with equal ease and expedition at all times when "wanted, then would the evils that are now complained of "not subsist; and this port would then be in nearly the best "condition its situation is capable of, and which indeed is "very respectable as a tide harbour, having a good capacity, "with from 16 to 18 feet water at common spring, and from "11 to 13 feet water at common neap tides; but it so hap- "pens, when there are storms or hard gales of wind from the

"south-western quarter, and at the same time, *short or low* "*neap-tides*, that such a quantity of beach will be lodged "between the pier-heads, and to so great an height, that, "according to my information, a vessel drawing but four "feet water can hardly get into or out of the port, at a time "when, if the mouth is clear as usual, there would be good "ten or eleven feet water into and out of the harbour.

"At those times there remains at low water *so great a* "*depth without the heads*, that the water from the sluices "has not a *sufficient fall and power to drive out the beach* "*from between the heads, but it is obliged to lay till the* "*spring-tides come on*, which, as it may sometimes happen "to be an interval of a week, produces great obstruction to "the packets established between Dover and Calais, as well "as to the mercantile trade of the place, and yet more to "general trade, as vessels may want the port for safety during "these intervals, but cannot enter it.

"The remedy for this evil, or as far as it is capable of re- "medy, is, as I apprehend, the object of the present inquiry; "and towards this end, two general methods present them- "selves; viz.

"1st. The prevention of the beach from getting into the "harbour's mouth; and

"2ndly. A more effectual way of clearing it out, when "it happens to get in at the times above specified.

"If the purpose can be fully effected by either of these, or "both together, this is the very thing to be desired.

"It seems, that formerly the breadth of ground between "the pent and the sea was so narrow, that there was great "danger of the sea making a thorough breach into it; but "that, upon a large fall happening at the *Castle Point*, a "quantity of beach was lodged, and the partition between "the pent and the sea was *greatly strengthened*, so long as "the fall lasted; but, upon the washing away of this fall, the "barrier was again greatly weakened, which being observed, "an *artificial pier or jetty* was erected at the same place; "*and ever since the beach has been so far retained as to lay* "*in a considerable breadth and strength between the pent* "*and the sea, and so as to put that matter out of all danger.* "This was certainly a very judicious piece of work, and the

"effect was fully accomplished, that is, of retaining a quantity "of beach to the westward of it, so as to make *an addition to* "*the coast:* but this being once made, to as great a degree "as the projection of this head is capable of retaining it, the "further quantity coming from the west, and passing by the "mouth of Dover harbour, is not retained by this head, but "gets round it, is again gradually washed up upon the shore, "and pursues its former course, and probably gets round all "the heads, and forms the beach in the Downs.

"The natural direction of the entry of the harbour is S. E. "by the present magnetic meridian, or about E. S. E. by the "true meridian; but, to avoid confusion, I shall confine "myself, in the mention of the points of the compass, to the "magnetic bearings only. The shape of the western head is "not only very uncommon, but to me very extraordinary; for "after it has been carried out in the natural direction of the "harbour's entry for about 30 feet, in a line at or about S. S. "E. it suddenly turns away to S. S. W. in which direction "being carried on between 60 and 70 feet, it is terminated "with a salient angle pointing to the same quarter. The line "of direction of this flank of the pier being continued in an "opposite direction, cuts within the eastern pier-head about "60 feet; so that, with all winds betwixt S. S. W. and E. S. "E. this flank is struck obliquely by the seas, and acts in the "manner of a tunnel towards bringing the seas (with wind "from S. to S. S. W.) and consequently the beach that hap- "pens to be lodged before the mouth of the harbour, directly "into the throat thereof. The south-eastern seas indeed are "so short that they do not much affect the mouth of this har- "bour any way; but, by the pier turning so much to the west, "it greatly facilitates the beach, after it has got round its "salient point, in getting along this flank; whose line of "direction being overlapped, as already pointed out, by the "eastern head, is thereby equally caught and retained when "the wind is more to the west than the S. S. W. direction of "this flank; for it is very observable that the seas will wrap "themselves round a head, and act with great power, several "points of the compass from the wind that causes it. *Nothing* "*therefore, as it seems to me, could have been formed more* "*improperly, with respect to the bringing of beach into the*

"*throat of the harbour; nor indeed in all southerly winds,* "*with respect to bringing in the seas into the harbour,* had "not this last effect been in some measure prevented by the "jetty or tongue projected from the eastern pier at the inner "entry into the harbour, which catches them as they run "alongside of the eastern pier.

"I would therefore advise, by way of lessening as much as "possible the quantity of beach that can get round and "lodge between the pier heads, and as the first and most "important work that can be done, to prolong or carry out "the first-mentioned line of the head, in its direction south "south-east, and that far enough to come into a south south-"west direction from the extremity of the east head, which "will be done by *extending this face about ninety feet,* "and then returning the outside so as to fall in with "the salient point of the present pier. The additional "work will form a sort of triangle, whose base will be princi-"pally formed by the present S. S. W. flank; and whose "projection forward towards the S. E. in a line perpendicular "to the base, will be but little above 60 feet further out than "at present. By this construction, all the good that arises "from the shape of the present pier head, *in regard to locking* "*in the beach, will be retained;* and as all winds that are "further out than S. S. W. (that is, than south of the true "meridian) which include all those the most prejudicial, will "meet the out-face of the new work obliquely, *they will* "*rather tend to send the seas and beach to seaward, than to* "*bring it round the head into the throat of the harbour;* and "as to all those winds that are eastward of the S. S. W. they "are found to be productive of no ill effect upon this harbour. "The intent then of this projection is not by way of lengthen-"ing the head, so as to make it lock in or retain a greater "quantity of beach; but by making it to overlap the eastern "head sufficiently to cause the beach brought coastwise by "the great seas at W. S. W. *to shoot beyond the eastern head* "before it is brought up again upon the shore, and by giving "it such a shape as shall also tend, in the most effectual "manner possible, *to make the beach drive out to sea,* till it "has passed the harbour's mouth."

"It is perhaps impossible to make a complete artificial

"harbour: for what improves it in one sense will often be of "detriment in another: for this reason the main drift and "purpose thereof is to be principally attended to, and, when "that is done to as great an advantage as may be, that har- "bour may be said to be in the most perfect state its situation "is capable of. I am therefore aware that this addition to "the head here proposed may meet with some objections "from seamen; for it may be argued, that the present westerly "turn of the head admits ships coming from the westward "with a scant wind at N. N. W. more easily and readily to "shoot up into the wind, and get between the heads (from "whence they warp into the harbour) with less risk of over- "shooting their port, than if this prolongation was to take "place. To this I answer, that, as there is frequently a bank "of beach lodged high against the pier, in the very place "where the new work is proposed, (ready to be driven in "between the heads by the first shift of wind more southerly) "this will, either by the reality or the fear thereof, prevent "vessels from making the turn of the west head sooner, "especially if they have no pilot on board, than if this vacancy "was occupied with a solid pier; which they will always have "the advantage of seeing above water, and against which, "from its shape and position, no material quantity of beach "can ever lodge. I must also observe, that, if a ship is "coming up the channel, intending for this port, she always "has either the *wind large*, so that she can keep a proper "offing, and alter her course proper to run right into port, or "else it is an off-shore wind, where, if she pleases, she may "drop an anchor before the harbour's mouth, and afterwards "warp in."

"It may also be alleged, that the present face of the "pier-head is sometimes useful for ships to lay alongside, in "order to cast off when the wind is fair, to go up or down "channel, and with such a wind as does not enable her "to sail out of port; but it may be observed in answer, that "besides the objection, that when a bank of beach is lodged "here, no use can be made of this side of the pier for this "purpose, it may be further observed, that, for all ships going "*easterly*, the proposed east face will be better adapted in "*southerly* winds than the present; and for ships going

"westerly, a transport buoy, fixed at a proper distance to the "south-eastward of the harbour's mouth, would answer far "better for this purpose than the present pier; and that, "even independent of such a buoy, there are some winds that "the proposed face would answer to, better for ships to cast "off from, to proceed westerly, than the present. I am told "that such a buoy has been formerly fixed and maintained; "and it seems very advisable that it should be replaced."

"This, in my opinion, is the whole and most effectual "means that can be used to prevent as much as possible the "beach from getting into the harbour's mouth. I come now "to consider the most effectual means of removing what does "come in."

"In the time of spring tides, as has been already observed, "there is no difficulty; and in regard to neap tides, as the "quantity that can get in, will, after the execution of the "proposed head, be *far less* than at present, it may with "*more ease be removed* even with the present power, &c."

"It may be proper to suggest that, when the port of Dover "is, by the means above specified, put upon the best footing "its situation is capable of, (that is, according to the best of "my judgment,) I apprehend it will be very eligible to be "more frequently used by the King's sloops and lesser fri- "gates, &c. &c."

EXTRACTS FROM NICKALLS' REPORT ON DOVER HARBOUR, 1782.

"The harbour at Dover can never be considered as a na- "tional object, unless a plan can be adopted to make it "capable of receiving large ships; and there is only ten feet "six inches of water, at the apron in the cross wall, at "neap tides, and which, in effect, is reduced to nine, by the "sill of the gates being layed eighteen inches higher than it "ought to have been. With so small a quantity of back "water, *at neap tides*, it will be impossible to remove the "bar, or keep open the harbour."

"To remedy these defects, the area of the pent should be

"increased to about thirteen acres and a half, which would "form a very large basin of water. The deepest part of the "pent being four feet six inches higher than the apron in the "cross wall, the whole should be sunk to a level with it, and "also the area of the basin. This would give from seventeen "to eighteen feet of water, at neap tides; and at the spring, "from seventeen to twenty-four feet."

"By *extending the heads two hundred feet farther into* "*the sea, the pebbles, I expect, would be driven by the cur-* "*rent into deep water, beyond the harbour;* but as this is not "certain, it will be necessary to provide for the worst, by "having canals and sluices in the heads, to cleanse every "part of the works, that the Commissioners might not be "subject to the heavy expenses they had been at, in the years "1727 and 1732, when it had cost them four thousand pounds "for removing the mud out of the pent and basin."

"When Cheeseman's head, built with stone, was extended "one hundred and thirty-three feet into the sea, it had "checked the force of the current at the south pier head, "and was found of great advantage to ships sailing with "certain winds into the harbour."

"When finished, the harbour will be capable of containing "three hundred sail of ships; and the largest frigates in the "royal navy may lay afloat in the basin."

EXTRACTS FROM RENNIE AND WALKER'S REPORT ON DOVER HARBOUR,

TO THE RT. HON. THE LORD WARDEN AND ASSISTANTS, 1802.

"The harbour of Dover appears from the oldest accounts "we have been able to collect, an object of national impor- "tance for ages past. Its being the nearest port between "Great Britain and France renders it of great consequence as "a harbour for the packets; and its situation near to the "Downs, of importance, as a harbour in which vessels pass- "ing through the channel may find *shelter in storms* or "contrary winds, or when in *distress*. On this account large

"sums of money have been expended on it, for the purpose "of keeping it open, and rendering it as commodious as the "nature of the situation would admit. Yet, notwithstanding "all that has been done, it still labours under some natural "inconveniences, which greatly abridge its utility; and unless "they can be removed, the harbour of Dover can never be "of use to the *commerce* of the country, which it otherwise "would be, were it in a state to accommodate such ships as "may have occasion to make use of it, and whose draught of "water does not exceed what can be made in this harbour."

"Could an accurate account be procured of the different "works which have from time to time been constructed at "Dover, with the different changes it has undergone, and "the effects they have produced; it would form an interesting "and useful piece of information; and would enable a better "judgment to be formed of the effects any new works would "produce which may be constructed for its further improve- "ment. But as we have reason to believe such an account "cannot now be procured, it becomes necessary to study "attentively the nature of the situation, and the causes which "have hitherto foiled all attempts to its complete improve- "ment and durability. These causes are the constant motion "of the beach or shingle, which by the action of the seas is "driven coastwise from west to east. For as the British "channel opens to the west and contracts to the eastward, "the seas are much more violent and heavy from the south- "western, than the south-eastern quarters; and consequently "although the beach in heavy south-easterly winds may in "some degree be moved westward; yet the general preva- "lence of the wind being the contrary way, the principal "motion is from west to east, and this is observable along all "the coast of Sussex, so much so that the mouth of the har- "bour of Rye has been protruded above a quarter of a mile "further to the seaward, within the memory of man, and the "point of Dungeness Head has been extended above a mile "to seaward.

"Whatever cause therefore may be assigned for the pro- "duction of so great a quantity of beach or shingle, the fact "is that the whole of the above district of coast is greatly "annoyed by it, and the general and prevalent motion is

"from west to east, filling, as it passes, every inlet where it "can find shelter."

"The beach has formerly been the destruction of the old "harbour, and the mouth has frequently been shut up, and it "is said to have remained in this state for years. The mouth "of the present harbour has been formed by cutting a channel "through the beach; and this channel, which probably was "made for letting off the water pent up in the inside of the "harbour, has been taken by the engineers who have been "employed on it as the best mouth for an entrance to the "harbour."

"It has been suggested by some, that the most certain and "effectual way to make a good harbour at Dover, is to turn "the water into its ancient channel, and to shut up the mouth "of the present harbour. To this opinion we can by no "means subscribe; for as we have observed uniformly that "the beach lodges in such recesses or inlets as it can find "shelter, we think that were a new opening to be made, or "rather the old one restored, its capability of lodging and "retaining the beach would thereby be increased, and of "course the annoyance arising therefrom would be increased "in a proportionate degree. We are, on the contrary, fully "persuaded, that the more the mouth of Dover harbour is "*protruded to seaward, the less beach will lodge in it, and* "*of course its entrance will be proportionally deeper.* There "cannot be a stronger proof of the truth of this assertion, "than may be seen at Cheeseman's Head, a jetty of stone "which has been erected to the westward of the present "harbour, and extending very considerably more to seaward. "This jetty intercepts the current of the flood tide, which "runs from three to four knots per hour to the eastward: the "beach which is brought along with it is projected outward, "and carried quite past the space which lies between the said "jetty and the western pier of the harbour, which space is "about 500 feet; but by the time it has got opposite to the "the present western pier, *it has lost its force,* and there "finds shelter, forming from thence a bank of nearly 300 feet "in length, which frequently shuts up the mouth of the harbour "to such a degree that vessels drawing three feet water can "scarcely enter it in *neap tides.*"

"When we were at Dover on the 2nd of November last, "which was the 11th day after the change of the moon, and "when the spring-tides were beginning to come on, the "sluices were run: there was 64 feet in length of the turn-"water set, and the bank of beach extended from the "extremity of the west pier considerably to the eastward. "The water at this running not being so high as in the spring "tides, nor the low water so far from the bank of beach, "it could not be expected the scour would be so powerful as "if it had been at the height of the springs; but from what "we saw we could readily form a proper idea of it; and we "have not any hesitation in giving it as our opinion, that "were even the basin and pent enlarged as much as the situ-"ation would admit, it would be *impossible* by means of this "water to scour away the beach so effectually as to render the "harbour at *all times open, and free of beach,* and thereby to "give it *all the advantages* of which it is *capable.* Unless, "therefore, some method can be devised of preventing the "accumulation of the beach to the extent it now does in "strong south-westerly winds, the rebuilding the western pier "on the best construction, making it *only the extent to sea-"ward it now is,* would, in our opinion, be expending a large "sum of money to *little advantage.*

"It appears to us, that the accumulation of beach across "the entrance of Dover harbour may, in a very great degree, "*if not altogether, be prevented,* by making the *western "pier the most prominent* part of that district of coast or "shore on which it is placed, and carrying it into a depth "of water and *strength of tide* sufficient to send the beach "past the mouth of the harbour, when the head is made of "such *a form* as to give it a *proper direction.*"

"A pier so extended would *force all the beach which was "in motion into the line of the current,* and we have no "doubt, generally speaking, it would be carried *past the "mouth of the harbour,* and what might lodge would *be small "in quantity,* and *easily scoured away.* In addition to this, "we advise that several short jetties be built to the westward "of the harbour, or perhaps a wall built for a short distance "along the shore with a jetty at its western end would an-"swer the purpose as well. It should, however, have a

"curve where it joined the western pier to give the beach a "direction towards the current: by this means a *sufficient* "*breadth would be maintained between the town and the sea.*"

"For the present, we advise that little, if any, addition be "made to the eastern pier."

"We are aware it may be said, *that by extending the* "*pier so far to seaward, the velocity of the current running* "*past its head would be much greater than it now is, and* "*thereby have a tendency to carry vessels, when entering,* "*past the mouth of the harbour; but this objection, we ap-* "*prehend, will have little weight, for in south-westerly winds,* "*vessels have generally considerable way, and as the harbour* "*will be much extended by this extra length of pier, they need* "*not slacken sail so soon as they now do, and of course they will* "*shoot further into it, than it would be safe for them to do* "*in the present state of the harbour: and whenever they get* "*into the wake of the head, they will be in smooth water.* "*With easterly and north-easterly winds, they will have less* "*difficulty in entering than at present, as the tide will be* "*thrown more into the harbour.*"

"We, therefore, trust such arguments will not weigh at all "against the extension of the western pier, &c. &c."

EXTRACTS FROM Mr. RALPH WALKER'S REPORT ON DOVER HARBOUR,

TO THE RT. HON. THE LORD WARDEN AND ASSISTANTS. 1812.

"My Lords and Gentlemen,—In obedience to your request "of the 1st of April last, I visited your harbour of Dover on "the 16th of the same month, and found such parts of your "works as had been done, executed in a satisfactory manner. "After having attentively surveyed the harbour, and made "such remarks as came at the time within my view; and "having received every information from Mr. Moon, on my "return to London I immediately took into consideration "what I had observed on the spot, and the information I had "received, and had arranged all my ideas on the subject,

"and had all my plans in forwardness to be laid before you, "when, on the end of June, I received notice to repair "immediately to Dover, as the south pier-head was in a "dangerous state."

"I now beg leave to propose what in my opinion would be "the best mode of rebuilding the south pier-head, not only "with a view to its durability, but also to the preventing the "beach which comes along the shore from the westward from "choking up the entrance of the harbour."

"As much has been said respecting the cause of the beach "choking up the mouth of the harbour by Mr. Smeaton, "and by Mr. Rennie and myself in a report of ours laid before "the board about ten years ago, I shall not enter into that "subject at this time, but only endeavour to point out what I "conceive would be the best mode of keeping it clear in fu- "ture, as far as the nature of the case will admit."

"I therefore propose that the *south pier-head should be* "*extended out as far as low water mark*, which would be "the means of carrying the beach into deep water, and in- "creasing the velocity of the flood-stream round it, and would "tend much to carry the beach *past the entrance*, and what- "ever might be deposited there by the flood tides would be "more exposed to the currents of the reflux of the tides, as "they would not be deflected without it by the north pier- "head; and if the culvert or tunnel proposed by Mr. Moon "should be adopted, and carried out through the pier from "the outer pent, I am of opinion that it would be of great "advantage in scouring away the beach, not only at the times "of low water, but also to draw the sluices off a little before "low water at the times of spring tides when there would be "abundance of water. I am aware it may be said, that the "beach carried away then would be brought back with floods "and westerly winds, but let it be kept in mind that by being "carried further out into deep water, *it will be carried past* "*the entrance before it could reach the shore.*"

"The form of pier-heads for harbours is of great impor- "tance: first, as to the easy ingress and egress of the shipping "with the prevailing winds, which in this country are about "nine months in the year from the south-west quarter; and "also that the *currents out* and *in* may be in as *fair* a

"direction as circumstances will admit. The present pier-head "has its imperfections of this nature; the angle projects ra- "ther too far into the entrance, and comes abruptly in the "way of the shipping; it also throws the current of the water "going out of the harbour upon the north pier-head, and "prevents it from having any effect upon the beach opposite "to the middle of the entrance, except when the turnwaters "are set in their places."

"I have consulted Joseph Huddart, Esq., an elder brother "of the Trinity House, who is without doubt the first nautical "engineer of this country, and he is *decidedly* of opinion with "me, that the pier head should be *carried out to the low "water-mark, &c. &c.**

"*At a meeting of the Assistants of Dover Harbour, holden at Dover the "16th January, 1813, for the purpose of taking into consideration the best mode "of rebuilding the South Pier-head,

"Present—Thomas Mantell, Esq. Mayor; Sir Henry Oxenden, Bart.; Sir "Edward Knatchbull, Bart.; William Deedes, Esq.; Sir Brook William "Bridges, Bart.; John Plumptre, Esq.

"Mr. Ralph Walker, Engineer, attended, and submitted to us his plans for "rebuilding the south pier-head, and his report thereon, (together with Capt. "Huddart's observations,) which we inspected, and fully examined him thereon, "and heard his reasoning in support of the same. We also examined Captain "Dubois Smith, of the Lively revenue cutter, on the Dover station, and who "appeared to have been thoroughly conversant with Dover Harbour 30 years, "and upwards, from whose evidence we obtained most useful and satisfactory "information. We also examined several of the pilots of Dover, who, from their "occupations and the almost daily opportunities afforded them of observing the "operation and effect of the winds and seas upon the harbour, we judged well "qualified to give us information on the subject; and from the result of the "above investigation, we are unanimously of opinion, that it will not be advis- "able to extend the south pier head beyond its present length, (in which opinion "we are confirmed by the report of Captain Huddart,) as any such extension "would increase the difficulties of getting to sea with the winds from the south- "ward and eastward. We are also unanimously of opinion, that it is essential "to the safe navigation of vessels into and out of the harbour, that the head "should be constructed of timber, laid open as the present north head, filling "up the inside with loose stones, as high as may be found requisite, which "will, in our opinion, tend to lessen the rebound of the sea, and thereby, in "gales of wind, cause less sea at the mouth of the harbour, and render the "interior of it less agitated; and that no material variation should be made in "the present form of the head, as by adhering to its present line much expense "will be saved.

"We are further of opinion, that if it meets the approbation of the Lord "Warden, Mr. Moon should be directed to make necessary preparations "for commencing the work as soon as the season of the year and the weather "will permit."

EXTRACTS FROM EVIDENCE

GIVEN BEFORE A COMMITTEE OF

THE HOUSE OF COMMONS,

APPOINTED TO ENQUIRE INTO THE

STATE OF DOVER HARBOUR,

IN SUPPORT OF THE PROPOSED PLAN.

1836.

THE COMMITTEE APPOINTED, WERE

Mr. Fector
Sir Edward Knatchbull
Mr. Majoribanks
Mr. Thomas Baring
Mr. Hume
Sir Charles Adam
Mr. Herries
Mr. Robert Steuart
Mr. Plumptre
Mr. Ingham
Sir John Rae Reid
Lord Viscount Mahon
Mr. Bernal
Mr. Elphinstone
Mr. Robinson

The HON. CAPTAIN GEORGE ELLIOT, R. N. called in, and examined.

[Ques. 1916. *Chairman.*] You are a Captain of the Royal Navy, and one of the Commissioners of the Admiralty?—Yes.

[Ques. 1917.] You have been lately at Dover, in consequence of instructions from the Government to proceed there to inspect the works, with a view of being examined before the Committee?—I have.

[Ques. 1918.] Will you have the goodness to state to the Committee any observation you have to offer on the works now in progress?—Before I state the observations, I should wish to say I have resided at Dover for two autumns, during which time I paid considerable attention to the harbour, and

to the nature of the difficulties they had to contend with to make it fit for a refuge harbour. There appeared to me to be three distinct heads into which the difficulties relating to Dover harbour divide themselves; and perhaps it would be more convenient to take them separately. The first is, as to the means of keeping the bar off the pier-heads, or out of the entrance of the harbour; and, secondly, as to rendering the harbour passable in westerly gales, either for vessels coming in or going out; and, thirdly, as to maintaining as deep a channel as possible all the way into the harbour from the pier-heads. There is another consideration of some consequence, namely, that of counteracting the injurious effects which the works of the last fifteen years have had upon the harbour itself, whereby a smooth-water basin, of considerable extent, has been converted into, if not an unsafe, at least a turbulent and contracted port. To begin with the bar. I consider there are two causes which encourage this bar: first, the projecting head, called Cheeseman's Head, throws the flood-tide off the pier-heads, and thereby admits of the eddy-tide from the bay passing the pier-heads, and running all the way up to Cheeseman's Head. When this tide becomes strong it throws the flood-tide off the western pier-head to a considerable distance; not less, I should think, than 100 yards, and in that place deposits a great quantity of sand, on which the passing shingle finds an easy bed, and is retained; and this seems to me to be the principal cause of the great formation of sand and shingle outside of the pier-heads, with the exception of the shingle which is washed up against the pier-head itself, and lies very close to it. It appears to me that the only means of getting rid of this outer bank of sand and shingle which I have alluded to, is by taking down the greater part of Cheeseman's Head, and projecting the present pier-head sufficiently to let the flood-tide strike upon its outer end; in which case I can have no doubt of that pier-head being kept as clear of shingle as Cheeseman's Head, or any other projection which is built into the sea on that coast; *and in no one instance have I ever seen it lay opposite a head which projected into the tide-way.*

[Ques. 1919.] Did you ever see it lay opposite to Cheeseman's Head, or to the Groins, on the east side of the bay?—

Never; I suppose the projection of the south pier, by about 40 yards, would be quite sure of reaching the flood-tide.

[Ques. 1921.] You are of opinion the extension of the south pier would obviate the collection of shingle which now accumulates at the entrance of the harbour?—I consider that it would not allow any quantity of beach, sufficient to be of any detriment to the harbour, to lay opposite the pier-head; and that by this extension beyond the present eastern pier, the beach, washed round in a south-west gale, would be carried clear of the eastern pier-head, generally speaking.

[Ques. 1922.] The effect of the two piers, as at present constructed, is to act as it were by suction on the shingle, and to draw the beach into the harbour?—I think there are several things relating to the two piers, and more particularly to the western pier, which I should like to explain my feelings upon. The gales of wind at Dover generally blow from about west-south-west; but the sea rolls more in from the south, so as to come in from a south-west direction. At present the sea, striking the long face of the western head, rolls up obliquely upon it, and when it comes to the south-east angle, the change of direction is so small that it rolls readily round into the harbour: I may almost say the swell is guided round, by the formation of the head into the harbour. Of course the swell, on striking the pier, is to a certain degree retarded, and therefore the outer part of that swell advancing more rapidly, is brought round so as to roll more directly into the harbour, between the pier-heads. In passing the western pier-head in this way, the swell immediately between the heads is actually *greater* than it is *outside in the open sea*, and no sailing vessel can attempt to get out in what I should call *moderate* weather in a south-west heavy swell, and even *steam-vessels dare not undertake it when the weather is at all bad.*

[Ques. 1928.] From the line that you propose the extension should take, is it your opinion that the head of the present pier is a bad formation?—I consider the head of the present pier an extremely bad formation in every way. In the first place, it presents a very large surface to the sea on the outer part, where it ought in my opinion to be as *narrow* as possible for strength.

[Ques. 1929.] You would propose then to alter the formation of the present pier-head, by extending it in the way you have suggested, by reducing its fronts towards the sea, and cutting off the inner angle?—I would project, from the east face of the western pier, with a view of meeting the tide, a pier, of sufficient strength to bear the action of the sea, that would be nearly in a line with the inner side of the western pier.

[Ques. 1948.] Have the goodness to state your observation on the second head?—At present the swell rolls so directly from the channel, and breaks so violently in it, that a vessel cannot go out even under the power of steam; and for the same reasons they dare not attempt to run in, for fear of being *dashed* against the *eastern pier*, or thrown broadside-to by a swell breaking round the western pier, and so run *against the western pier*. In either case they would probably, in a gale of wind, be *destroyed*, the swell between the pier heads being quite sufficient to bilge any vessel that strikes them with any force. The long south face of the present pier-head guides the swell round into the channel, and rather *increases it inside* of the head: whereas, if *the outer face of the western pier pointed to the eastward, the swell would be thrown in an outward direction*, and the moment a vessel passed the extreme end of the pier she would be in *smooth water*. A vessel coming in before the wind, as she would do in south-west gales, would have sufficient velocity to shoot up all the way into the harbour; or if not, to get completely up alongside, of the eastern pier, where the water would be *so smooth* she would be in *no danger*. In going out in bad weather, in westerly winds, a vessel would keep close round the eastern pier-head, and thus avoid the break of the sea, which now takes place round the western pier; I therefore consider that vessels might go either in or out with the alteration in the pier-heads that I have proposed, in any weather that could render it desirable for a vessel to go out, or in almost *any weather* a coasting vessel could be found at sea. Two objections are, I observed, started by persons on the spot to the proposed projection of the western pier, as interfering with the convenience of the harbour. The one is, that it would throw the vessel so far to leeward with the winds that mostly prevail, namely, from west-south-west,

that they could not fetch up between the piers into the harbour: the second is, that in going out in easterly winds vessels would have a difficulty in clearing the western pier-head. I do not consider that either of those objections are sufficient to be taken into account, as compared with the benefit which the harbour would derive by the projection. Indeed, if the harbour is be to considered *a refuge harbour, the alteration I propose must take place;* for at present no vessel can go in, or dare go in, in bad weather. And if it is not to be considered a refuge harbour, I am at a loss to conceive how it can be justified that the passing trade are to pay a tax towards that harbour. I have stated that the difficulty might be very easily overcome. I consider that on a vessel rounding the pier with the wind at west-south-west, that she would have so much way in coming in before the wind, and she would be brought round so suddenly by the tide on her bow coming inside the pier-head, that she would have quite sufficient velocity to shoot into the harbour itself: but I cannot conceive, even in any state of *distress*, that a vessel coming in before the wind would not have velocity enough to shoot inside the eastern pier-head, which is all that could be desired for her safety; all that is necessary; and the difficulty of getting out with an easterly wind may be very easily remedied, either by laying down a warping-buoy, or, what is used in many places, an endless chain or rope, through a block moored outside the pier-head. Those are the only *two objections* I could find among the *seaman* of the place to the projection of the eastern pier-head.

[Ques. 1953. *Chairman.*] In the present state of the harbour you, as a naval man, would not venture to take a ship in there with a strong south-west gale?—I do not think that any vessel can go in, in what may be fairly called a south-west gale; that is, if the wind is anything like what a seaman would call a gale of wind.

[Ques. 1954. Sir *C. Adam.*] That is on account of the heavy sea that breaks there?—Yes.

[Ques. 1960. Sir *J. Reid.*] I do not wish to offer an opinion, because I do not feel myself competent to do so; but if I understand Captain Elliot's information, his decided opinion is, under all the circumstances, and with reference to the pro-

gress of the work, that you would make no alteration until the present plan has been tried?—Why I cannot say that that is quite my opinion; because I have already stated, that I consider that if the whole of the present plan was completed, the harbour, as far as regards a *refuge harbour*, would be just as *imperfect as it is at this moment.*

[Ques. 1961, Mr. *Fector.*] Do you not think that if the improvements in the harbour you have suggested were carried into effect, that Dover would then be a good harbour of refuge?—I think it would be a very good harbour of refuge, as far as the entrance goes; but I must say that I consider the harbour has been seriously injured, perhaps from having the entrance so much defended from the swell. It might be a good harbour in all respects, but at present one of the great inconveniences that is felt, even by vessels that are lying in the harbour, is, the modern alterations that have taken place have contracted the harbour to such a degree, and in such a manner, that is to say, with upright walls instead of having beach, that the swell is such in the harbour at this moment, that the vessels rise and fall by the pier, as much as *six feet*, and they can no longer lie as they did formerly in tiers, but must lie a considerable distance from each other, on account of the motion. Formerly, when the swell rolled into the harbour, it came into a large open basin, with a beach on each side; and of course wherever there is a beach of that sort, the swell breaks and wastes itself, so that it rolls up with very little force towards the end of the harbour, and it was tolerably smooth.

[Ques. 1962.] Would it be a difficult matter, in your opinion, to restore the outer harbour to its original state in some degree?—I think a much better beach, and more extensive beach, ought to be made on the *eastern side* of the harbour, immediately inside the little projecting jetty, that is on the inner end of the eastern pier; there is a useless upright part, it is only protected with piles, which might be taken down; and if the beach was made there, it certainly would be very beneficial to the harbour, as means of wasting water.

[Ques. 1969. *Chairman.*] You have known Dover harbour for a considerable number of years?—Yes, I have.

[Ques. 1975. Lord *Mahon.*] When you first viewed Dover harbour, did you view it with professional attention, or merely, as in passing, did you examine it?—Until about four years ago I never passed more than two days at Dover at a time, waiting, in bad weather, to go across, or waiting for a day after bad weather, having passed from the coast of France: but as I take an interest in things of that sort, I certainly always looked at it in those times; and happening to pass very frequently in bad weather, I looked at it with the interest that is natural to a naval officer; and more particularly, as I have always considered Dover harbour would be, hereafter, a harbour of *great consequence, if this country should be at war.* Since the introduction of *steam,* every body must be aware it places the two countries so much *nearer* each other in point of communication, that those harbours become of much *greater consequence;* and I passed two autumns there two or three years ago, during which time I certainly watched the harbour very closely, and looked at it, and obtained all the information I could from the history of what had been done in former times in the construction of the harbour.

[Ques. 1999.] Can you mention as to the expense of your proposed alteration; have you formed any idea what the amount will be?—No, I have not any idea of the expense, but the projection of about 40 yards for a small open pier-head cannot be very great. Mr. Cubitt was down there looking at the pier at the same time I was, and I had a good deal of communication with him on the subject; *his opinion seemed to coincide a good deal with my own,* and I went down with him on the sand to *mark the distance,* as near as we could, that we thought would meet the *tide,* so that he would be able to inform the Committee on a subject of that sort.

Captain HARRY DAVID JONES, called in, and examined.

[Ques. 1741. *Chairman.*] You are a captain of the Royal Engineers?—Yes, I am.

[Ques. 1742.] You have lately been at Dover in consequence of an instruction from the Government to inspect the works there, with a view to being examined before this committee?—I have.

[Ques. 1744.] Will you have the goodness to state to the Committee, the observations you have been enabled to make with regard to Dover harbour, in order to enable the Committee to judge how far the works in progress will, in your opinion, remove the natural obstacles which are presented to ships entering the harbour, by the formation of the shingle at the pier-head?—I beg leave to observe, that the season was very unfavorable for making those observations which I should have wished to have done as an engineer. The prevailing wind during the time I was in Dover, and for 30 days previously, had been constantly blowing from the eastward, which is in a direction opposed to the formation of the bars which occasionally block up that harbour. There is one point which appears to me quite decided in the minds of every body, that the shingle moves gradually from west to east, when unobstructed; and that during the time the harbour was forming at Folkstone, very little shingle passed the head of Dover harbour, for this reason, that it was stopped at the back of the sea-wall which now forms the harbour at Folkestone; and the same results have always been found to arise from any projection which has been made to the westward of Dover harbour. It would have been very desirable to have altered the figure of the south pier-head when the present works were projected; for it is very evident, on an inspection of any projection into the sea, either to the east or west of the harbour, where the heads of those projections are of *small* dimensions, that the shingle has passed clear away from them. The figures of both pier-heads, north and south, seem to be very objectionable: very little, if any, alteration appears to have been made in the figure of them from the time the pier was first projected by a Mr. Thompson. The south pier-head, in its present form, was evidently constructed to receive artillery for the defence of the harbour. This may have been very necessary at that time; but it certainly was not the best figure that could be given to the pier-head, as forming one side of the entrance to the harbour. With regard to the culverts, it has been mentioned to me that, at certain times, there are *two or three feet* water at low water, at the foot of the south pier-head. If such is the case, the column of water passing through the culverts will be lessened by the height of

the water standing on the outside, and additional pressure will be acting on the body of shingle which is already formed there, in proportion to the height of the sea. Again, I am told, with certain winds, the tide neither *ebbs* nor *flows* in the harbour, consequently those culverts would be perfectly *ineffectual*, should any accumulation of beach take place at that time. There were several complaints made of the very uneasy way in which ships ride in the outer harbour, in consequence of the cross-wall which had been made to form the wet dock, in consequence of the sea not having room to expand itself after passing the pier-heads. If an alteration was made in the figure of the pier heads, so as to make the entrance to the harbour two straight lines, instead of being indented as at present, particularly the *south pier*, the shingle could not lodge there, which is now the case; and which, to make a virtue of necessity, is said to be advantageous, as vessels standing in for the harbour run upon this bank, instead of against the piles of the pier; but I am of opinion, that if the alteration which is now mentioned was made, that this would *never* be the case, and the action of the backwater would be much more *effectual*, and the expedient of the turnwater, to which they are now obliged to resort, would be avoided.

[Ques. 1745.] When you speak of the alteration, do you mean the alteration of the pier-head?—Yes.

[Ques. 1752.] Did it occur to you, that the formation of the two piers operated so as to draw, by suction, the shingle into the harbour?—I think the action of the sea along the pier-head and then running round it, which it naturally does, is the cause of the shingle being brought in, as well as reaction in south-west winds from the north pier. I should also add, that there is a spit of beach which runs out a considerable distance in front of the north pier-head: the easterly winds have the tendency to set that into the harbour also.

[Ques. 1756.] But judging from the description which has been given to you, is it your opinion that if the south pier was carried out in a point considerably beyond the north pier, that the beach would then be carried past the north pier altogether, instead of being, as at present, drawn into the harbour?—I should think so, *decidedly*.

[Ques. 1765. Mr. *Plumptre*.] Is it your opinion the pro-

bable extension of the pier would prevent the accumulation? —*Certainly.*

[Ques. 1768. *Chairman.*] Was it stated to you that the shipping occasionally suffered from a swell of the water in the harbour? —It was mentioned to me it was so uneasy that vessels could not ride there; and very lately an accident happened to some vessel that was trying to make fast there.

[Ques. 1769.] What is your opinion as to the cause of that? There can be no doubt as to the cause arising from the reduced space by the formation of the cross-wall forming one side of the wet dock.

[Ques. 1770.] The sea not having sufficient space to expand? —Yes, and the consequence is a re-action from the walls surrounding the harbour.

[Ques. 1771.] Might that be obviated by having the pier-head formed of loose stones, so as to enable the sea to expand itself in the loose stones, before it finds its way into the harbour?—It might have the effect of lessening the force of the sea; but the harbour being so very *near* the entrance, I do not think it would obviate it.

[Ques. 1772.] Do you think the extension of the pier would operate at all upon that?—*Certainly;* but then both piers must be extended, so as by carrying the channel further into the sea, and by creating a longer distance for the sea to run before it enters the harbour, it would lose much of its force.

[Ques. 1773.] Let me understand; do you propose in extending the southern pier, to extend the northern pier also? —*No, certainly not.*

[Ques. 1774*.] But if the sea is running from the south-west, the wind of course being in that point, if the pier is extended to a considerable extent, and formed in the way I have mentioned, by piles and loose stones, would not that cause the sea, which finds its way into the harbour, to be deprived of a considerable portion of its power, and render the harbour more quiet?—*I should consider so, certainly.*

[Ques. 1776. Mr. *Elphinstone.*] Might not the swell be lessened by having a slope all round?—Yes.

[Ques. 1781. *Chairman.*] I think you have expressed a pretty strong opinion that it would improve the harbour, and obviate the present natural defects of it, to extend the pier out to a considerable distance?—*That is decidedly my opinion.*

[Ques. 1794. Mr. *Plumptre.*] You say the pier under the castle secures a certain quantity of beach within the bay? —So I am given to understand.

[Ques. 1795.] Did you learn, or do you know the beach still travels round that pier, and goes eastward?—I understand that, since the prolongation of that pier, the beach has not gone to the eastward; and, upon the same principle that I have mentioned with respect to groins, the old pier, which had very little projection, had got filled up by the accumulation of the beach, and then it began to pass away to the eastward; but since that pier has been extended there has not been time for the beach to fill it up, consequently it is now lodged within the bay. I was down there the other day, and, between the east side and the west side, there was a difference of 60 feet between the lines of the shingle: that on the west side was 60 feet more advanced than the line on the east side.

[Ques. 1798. *Sir E. Knatchbull.*] Could you give protection to that property by any other means than an accumulation of beach?—*Certainly;* I conceive at this moment there is sufficient beach, which might be secured by a sea-wall or other means, so that no idea of danger could be entertained in regard to the safety of the houses.

[Ques. 1804. Mr. *Plumptre.*] You have said, with regard to the outer harbour being rendered now unsafe in consequence of the swell, that it is so because the harbour has been diminished?—I was given to understand, before the new cross-wall was erected, there was no swell to make it uneasy for ships.

[Ques. 1806. Sir *Edward Knatchbull.*] You cannot speak, of your own personal knowledge, as to the inconvenient state of the outer harbour?—Certainly not.

[Ques. 1807.] There is a statement you made upon that point, which is from the information you collected when at Dover last week?—Yes. I can speak as to what I saw one evening, when it was not blowing by any means *very strong*, that the fishing-boats were rolling about *much more* than I think they ought to have done.

[Ques. 1810. Captain *Dundas.*] Would it be a better harbour of refuge with your stone pier, for £5,000, than it would be with a culvert, and additions that are making, for £24,000?—If a pier would have the effect which is contem-

plated, it would send the shingle *past* the harbour's mouth *undoubtedly;* but then I should add, that this estimate of £5,000 was not estimated for the work, as an extension of the present pier, but more as a *groin*, which would be a very different work.

[Ques. 1812.] Which would be the best harbour of refuge, the works as they are now going on, or the groin of 100 feet which you have mentioned?—*A groin of 200 feet* would make it a better harbour of refuge than the present one, for the reason given to me by the *harbour-master* that, if Cheeseman's Head was extended 100 feet further, there would be a greater space for the eddy, and consequently it would be easier for ships to enter, which, since the part of Cheeseman's head has been taken away, has occasionally been found very difficult.

[Ques. 1815. Mr. *Baring*.] You said the breadth of the termination of the pier produced a larger accumulation of shingle than a narrower pier would?—I am induced to state that from observing the narrow pier-heads on the coast which I have seen, *where there was no accumulation of shingle, and all passes clear away.*

[Ques. 1816.] Your opinion is it would all travel eastward, without any inconvenience to the harbour?—*Certainly.*

WILLIAM CUBITT, Esq. called in and examined.

[Ques. 2026. *Chairman.*] You are a civil engineer?—I am.

[Ques. 2028.] You have lately been to inspect the works now proceeding in the harbour of Dover, by the direction of the Government with the view of being examined before this Committee?—I have.

[Ques. 2037.] Now, is it your opinion that the sluices, as are now being constructed, will remove the shingle that accumulates within the harbour?—No, they will not; if shingle be suffered to come past the action of the present sluices, other means must be adopted of taking it out of the entrance of the harbour, and there are other means for that purpose, but not of an efficient kind; not so efficient as they might or ought to be.

[Ques. 2038. Mr. *Plumptre.*] When the present sluices are finished, need any beach be allowed to go round the head

into the harbour?—That will depend on the experience which I first alluded to; for this reason, in spring-tides I have no doubt but the pipes will keep the pier-head clear of shingle every tide; but it sometimes happens in neap tides that there is very little flow, perhaps not more than *five* or *six feet* occasionally, and at those neap tides the water never ebbs clear out of the harbour: *it always leaves water, four or five feet at low water, in the aprons of the sluices.* The consequence is, you would have a less head of water within, and a heavier tail of water (as we may term it) without it. The sluices cannot have so great an effect at *neap-tides* as they can at spring-tides, and it is at those times that shingle will get into the harbour, if at all: it is at those times when the pipes are least efficient.

[Ques. 2039.] It appears to you to be matter of doubt whether the shingle will get into the harbour at all, the pipes being perfected and in full operation?—The pipes may be perfect and in full operation, as regards their capability, but if there be not sufficient head of water to induce a sufficient velocity to remove the shingle bank away from the pier-head, the consequence is, the next tide will bring some of it into the harbour within the head, and when within the head, those pipes cease to have any effect upon it.

[Ques. 2040.] Are you aware of the turnwater at the eastern pier?—I am; there are two turnwaters at the eastern pier.

[Ques. 2041.] Suppose the beach got within the mouth of the harbour, do you think those turnwaters with the sluice within the harbour, would operate to clear the mouth of the harbour?—The turnwater and the pipes within the pier are not applicable to each other: the turnwater is not made with relation to that pipe but with regard to the sluices up at the back of the harbour.

[Ques. 2042. Mr. *Goulburn.*] Would not the sluices at the back of the harbour, guided by this turnwater, clear out any shingle which might get into the harbour at these neap-tides?—The same difficulty holds with regard to the back sluices at low neap-tides, the quantity of water on the turnwater aprons, and the small head of water to drive it out of the harbour.

[Ques. 2043.] But the next spring-tide those means would effetually clear the harbour?—They would at the spring.

[Ques. 2044. *Chairman.*] But then during the interval the harbour would be choked up, or at least not sufficiently clear to make it safe and commodious?—Admitting the shingle gets in at all, and is suffered to collect at neap-tides, such must be the consequence; but there is no doubt whatever that the present improved means of scouring will make the harbour better than it has been before. If they do no more than complete what they are now at, it will be a great improvement; that I can have no hesitation in saying.

[Ques. 2046.] The present works will however be a palliative; they will not prevent the accumulation of sand under particular winds and circumstances?—There are circumstances, which I have pointed out, in which it is possible they may not be able to keep the harbour effectually clear, *the circumstance of westerly winds, neap-tides, and a small flow.*

[Ques. 2052.] State to the Committee what alteration you would propose in the head, suppose these works are unsuccessful?—Suppose these works do not do so much as is expected from them, (for successful they must be in a great degree,) I have yet seen no better plan or form of altering and enlarging the present pier-head than this plan of Mr. Smeaton, none at all; and *I think it very probable that some such addition to the western pier will one day become necessary, inasmuch as the smaller the end of the pier is, the less quantity of shingle that can possibly lie against it.* The present pipes, that now terminate at the present pier-head, will simply have to be extended by an additional length of pipes to terminate at the point of the extension and along the inside face of it, which would be a very proper place for them to act upon.

[Ques. 2054.] Would you propose such an extension to be a solid pier, or an open pier on piles?—Not exactly one or other, but an extension formed with piles, and filled with what they call Folkestone stone; therefore all that has been done, with regard to the reservoir, the pipes and the machinery, would remain exactly as originally proposed without alteration, and the addition of expense would be simply the *extension* of the pier-head and pipes.

[Ques. 2062. Mr. *Elphinstone.*] Suppose an extension of the pier, such as you have suggested may probably be necessary, were made, would not that extension in some degree

prevent that accumulation of shingle within the harbour which now takes place, by throwing it completely past the point of the other pier?—Whether the other pier is there or no, I think it does not affect the operation at all. The effect would be if the present pier were lengthened as I have proposed, or similar to Mr. Smeaton's recommendation, and Cheeseman's Head shortened, the eddy-tide, instead of coming home to, and even past the present pier-head, *would terminate eastward of the north pier-head.*

[Ques. 2063.] But the effect of that would be to carry the shingle past the mouth of the harbour?—Yes, it would have a *greater tendency* to do that.

[Ques. 2064.] You are aware that a considerable portion of the town of Dover is built upon a deposit of shingle round that part of the coast which is called the bay of Dover?—Yes, I am.

[Ques. 2065.] That property would become insecure if a supply of shingle was not conveyed into the bay?—It would.

[Ques. 2066.] Do you conceive that such an extension of the pier as you have proposed would prevent the shingle from being carried there in sufficient quantities to afford the adequate supply?—*Not at all*; because if at the same time the pier-head was lengthened a little, Cheeseman's Head were shortened a little, the supply of shingle would not be stopped, *and a constant quantity would continue to pass the harbour's mouth into the bay.*

[Ques. 2071. *Chairman.*] Are there any other objections to Dover that you have been made acquainted with since you have been there, as a place of refuge for ships when they get into the harbour?—The harbour is not so good as it used to be.

[Ques. 2072.] What is the cause of that?—*There is too much range of sea, and there is not one inch of slooping beach for the sea to expand when entering the harbour. The consequence is, that vessels lie very unquiet, from the harbour being surrounded by upright walls.*

[Ques. 2073.] Had you any opportunity of observing the effects produced on the ships in the harbour from your own observation?—Not when I was there this time; but I happened to be there about six weeks before on other business, when there was a very strong gale, very bad weather, and a

very *heavy sea* setting into the harbour; and the vessels laid *so unquiet* that it required two men to stand and hold on the steam-packet ladders, not suffering them to touch the wharf as the vessel heeled: and at that time there was an exceedingly bad bar; so bad that there was scarcely room for the steamer to get out at all between the shingle bank and the east pier.

[Ques. 2079.] You spoke of the agitation in the harbour that you saw during your visit paid to Dover: from what point do you recollect the wind was blowing at the time?—West-south-west and westerly, I believe.

[Ques. 2081,] From your experience in harbours, should you not say that if the western pier was extended, and turned more towards the east, that would protect the harbour from the sea running into it, and causing the violent agitation which you have just now stated to exist?—It might in some little degree cure the evil of the agitation.

[Ques. 2084.] Is not one of the reasons that makes it so difficult now for a vessel to enter, that the agitation of the water at the mouth of the harbour is so great, that if she misses the one pier, she is apt to be thrown on the other?—Yes.

[Ques. 2085.] But if that pier is constructed in the way you have described, so that the sea would force its way through the stones and expand itself, would not a vessel be in smooth water as soon as she had got round the point of the pier?—She would be in *smoother water no doubt.*

[Ques.2086.] Have you any general suggestion or observation to make upon the state of Dover harbour to the Committee?—I can scarcely say; I could answer to any inquiry, according to the best of my judgment of those inquiries; it is a difficult point to make suggestions on those matters; if suggestions are to be made by me at all, I should suggest the harbour being completed according to this present plan, and experience had of the result. I also think that means should be taken to have a beach in the harbour, upon which seas coming in could expand themselves and quiet the outer harbour, *which could be done.*

[Ques. 2087.] How could that be done?—By taking down a portion of the jetty at the back of the turnwater

apron, and laying two or three acres at the back of the "full" into the harbour.

[Ques. 2098. Sir *C. Adam.*] You said there are some nautical points so self-evident that it only required common sense to understand them?—Some of them.

[Ques. 2099.] Can Dover harbour be made a good harbour of refuge while it is exposed to such a rough sea as you have described in the very entrance of the neck of the bottle?—*No; but what I have described would do away with that roughness in a great degree, as well as doing away the counter currents, the counter set, which is the great cause of it, and which is the cause of the deposit of shingle opposite the pier, which would not take place to such a degree if the counter current was done away.*

[Ques. 2100.] But it is quite clear it would be a much better harbour of refuge if it had beach as you have described inside of it?—Yes, it would be a better harbour for all the common purposes of harbouring vessels lying inside, and beaching boats similar to the potato garth at Sunderland.

JAMES WALKER, ESQ. called in, and examined.

[Ques. 707. Sir *Edward Knatchbull.*] You are a civil engineer?—Yes.

[Ques. 708.] How long have you been in the practice of your profession?—From 25 to 30 years.

[Ques. 710.] When were you first consulted respecting Dover harbour?—The first application was made to me in November, 1834.

[Ques. 711.] By whom was that made?—By a letter from the prime warden, the Duke of Wellington.

[Ques. 714.] What did you do in consequence of that?—I visited Dover very shortly afterwards, and examined the works then in progress, and complied as far as I could with the instructions in his Grace's letter.

[Ques. 718. *Chairman.*] Will you describe what the nature of the obstacle is for the removal of which this plan has been constructed?—I have stated that the obstacle, which is called the bar, is of a very peculiar nature. The object has been that which every engineer who has been consulted has been so desirous of obtaining, that is, of removing the shingle

when it came to the pier; and it appears to me that the remedy, although a very expensive one, cannot fail to be complete.

[Ques. 719. Mr. *Plumptre.*] The opinion has been that they could not prevent the shingle from coming through; and your object has been to remove it?—Yes, Cheesman's Head was carried out to prevent it; but as soon as the receptacle for shingle on the westward of Cheeseman's Head is full it travels round the head of Cheeseman's Head and gets to the harbour.

[Ques. 720. *Chairman.*] Does not the space between the point of Cheeseman's Head and the point of the pier act as a sort of draught to draw the shingle in?—I think not: Cheeseman's Head has been more extended than now. It was supposed that it was too far out: it has been shortened again, and there are doubts now whether things are better than they were. If it were carried out a little further the receptacle would be larger: the shingle would still travel round.

[Ques. 721.] What is the distance between the pier and Cheeseman's Head?—About five hundred feet.

[Ques. 726. Mr. *Plumptre.*] You state that the object of all the engineers has been to remove this bar; do you recollect the names of any other engineers who have had the same object in view?—Yes; Mr. Grundy, the late Mr. Rennie, Captain Huddart, the late Mr. Walker, and Mr. Moon.

[Ques. 727.] Did Mr. Smeaton recommend it?—Mr. Smeaton mentioned the evil, but suggested a remedy by extending the west pier a little, and altering the direction of the head, with the idea of throwing the gravel round it, apparently that it might pass the entrance altogether. I think that what the commissioners have in view is the sound policy; that is, supposing the shingle to accumulate, to have the power of removing it; *because if the west pier to any extent were carried out, there is no doubt that having this body of water to discharge upon the bar would be desirable.*

[Ques. 808. Mr. *Fector.*] Do you not think that the outer harbour has been very much injured, as a place of refuge in bad weather, by extending the cross wall?—Probably it is, for I think the larger the harbour the better.

[Ques. 818. *Chairman.*] Are you aware of the nature of the improvements that have been made in Dover harbour during the last 30 years?—Yes.

[Ques. 819.] Do you consider them to have been judicious?—That is a large question; it requires a good deal of adding and deducting to be able to answer the whole question: altogether I have no hesitation in saying, that as regards a harbour of refuge, it would have been better without walls at all, so as to have a *sloping bank* all round.

Mr. JOHN IRON called in, and examined.

[Ques. 424. *Chairman.*] You are harbour-master of Dover?—I am.

[Ques. 436.] Do you keep a register of the depth of water in the bar daily?—Not at the bar; I keep a register of the depth of water that is in the turn-water.

[Ques. 437.] You mean the north pier?—Yes; I mean the index-board placed against the south pier.

[Ques. 438.] What is the average depth in ordinary neap tides?—About 13 feet; in spring tides about 17 feet 3 inches.

[Ques. 441. Mr. *Hume.*] Are we to understand that when the index shows 13 feet, a vessel of 13 feet of water can come in?—Not if the bar is across, but in the channel, whichever way the channel may be formed.

[Ques. 442.] Do not the banks of shingle often shift at the mouth?—Decidedly.

[Ques. 443.] In the ordinary state of the harbour, what is the breadth of the channel?—In the ordinary state of the harbour, I should say 100 feet.

[Ques. 444.] In answer to a question, "Can a vessel drawing 13 feet of water come into the harbour when the index in the turn-water shows 13 feet depth," you said, "No; but they could come in the channel." What is the depth of that channel?—That depends upon circumstances, according to the quantity of beach that is washed round the pier.

[Ques. 445. Mr. *Dundas.*] It is an unknown channel?—It changes according to the wind.

[Ques. 448.] Does the state of the wind, easterly or westerly, have any great effect?—The south-west wind makes the bar: the east wind has no effect on it.

[Ques. 449.] In what employment were you before you were appointed harbour-master?—I was Cinque port pilot, from 1808 to 1832.

[Ques. 451. *Chairman.*] As a Cinque port pilot, you have had great experience in conducting ships through the channel and through the Downs?—Yes.

[Ques. 452.] Have you often had occasion to take ships into Dover harbour in case of distress?—*Not myself; very few.*

[Ques. 453.] Do you consider it a good place or a desirable place of shelter for ships or vessels in a heavy gale of wind?—I do.

[Ques. 454.] You consider it a safe place for ships to run to? Yes.

[Ques. 455.] You have often, then, in the conduct of ships been overtaken by a gale of wind in the neighbourhood of the Downs?—Yes.

[Ques. 456.] How did it happen, as you consider it a good and safe place of refuge, that you did not take them in, instead of keeping them out exposed to the gales?—In my situation of pilot it never occurred that I wanted to go into any harbour in my experience.

[Ques. 457.] Are the packets never obliged to bear away from Dover harbour to take refuge elsewhere?—Very often, in consequence of the wind and a *heavy sea.*

[Ques. 458.] Is it the wind that prevents them reaching Dover harbour, or is it the danger of entering Dover harbour when the sea is heavy?—*Both;* sometimes there is too much sea to enter, and at other times they could not possibly get there in consequence of strong south-west gales.

[Ques. 459.] I think you stated just now, that you considered it as a place of refuge for ships?—I do still.

[Ques. 460.] How do you reconcile that with your former answer? I consider that there are few harbours in England that at all times ships would run in with a heavy gale of wind.

[Ques. 461.] Generally speaking, Dover Harbour, in a gale of wind, is accessible to ships?—In the north-east gales it is, *but not in a heavy gale to the south-west.*

Captain BOXER called in, and examined.

[Ques. 1583. *Chairman.*] You are a captain of the Royal Navy?—Yes.

[Ques. 1584.] Have you resided in Dover for any considerable period?—Yes; it is my native place. I was employed during the war, from 1798 until the peace, but occasionally came home to see my friends during that period.

[Ques. 1586.] You have had opportunities of observing all the different alterations that have been made in the harbour of Dover during the last 20 years?—Yes, certainly.

[Ques. 1587.] Is the harbour of Dover, in your opinion, a better harbour now than it was 20 years ago?—No; I am decidedly of opinion it is not, and I give that opinion as a sailor.

[Ques. 1588.] Would you have the goodness to state to the Committee any observation you have made upon the different works that have been carried on since you have known the harbour of Dover?—I think it was in 1820 they commenced the plan of running sluices through the south head, and cut off a considerable portion of the outer harbour for that purpose; which, in my opinion, has almost ruined it as a place of *shelter* for ships in *bad* weather; but I think it might be improved by running out the south head about 40 feet, so as to cover the north head and the mouth of the harbour from the heavy sea that breaks on it during heavy gales from the south-west, or by covering the mouth of the harbour by a *breakwater* of open piles.

[Ques. 1589.] Previous to this alteration which you speak of, as the first which was made with which you were acquainted, did vessels lie in safety in the outer harbour?—I should say so, *certainly*.

[Ques. 1590.] One of the objects of this plan was to obtain a dry dock?—I cannot say that. I think if that was the object of the plan, they could not have put the dock in so bad a place as they have put it.

[Ques. 1591.] Where should you have proposed to have put the dock?—I should have proposed to put it in the basin, close to the *York Hotel*.

[Ques. 1592.] You consider if the basin had been adopted that a commodious dock might have been formed at a small

expense?—I should suppose the expense would have been the same; and I consider the object of taking in the outer harbour was for the purpose of conveying the water through the sluices to the south head, so as to throw the beach from it.

[Ques. 1593.] When you speak of the beach, do you mean the shingle which accumulates by the south-west wind to the south of the harbour?—Yes.

[Ques. 1594.] And which unless it is removed, is a complete barrier to the entrance of vessels?—Yes.

[Ques. 1595.] Have you seen the harbour frequently in that state?—Yes; and I wish to explain a little with regard to this head. It is my opinion that no head could be worse formed; it appears to me, not only to convey the beach into the harbour, but also the sea. If you will take the trouble to look here, (pointing to the plan of the harbour by Mr. Smeaton,) the sea comes in at the south-south-west, it then catches this angle, and throws the beach past these tunnels, and right into the harbour; and I have seen it almost fill the mouth of the harbour in a tide, in a very heavy gale of wind from the south-south-west, therefore rendering those tunnels of no sort of use whatever. I am speaking of the old plan. We have then nothing but the back-water of the basin to throw it away; and when that happens in *neap tides*, it is almost impossible to move it at all till the tides take in to get more head of water.

[Ques. 1596.] You have before spoken of the old works?—You see the formation of this head (*referring to Mr. Smeaton's plan;*) here comes the sea, along the south-east angle, from south-south-west, *cutting inward* 60 *feet within the north head:* the consequence is, the beach runs round into this bight until it fills up the mouth of the harbour: we are then obliged to cut it through here by means of labour, so as to get an opening to the southward, when the beach gradually washes away to the eastward.

[Ques. 1597.] Does it ever come back from the eastward?—No; when I say to the eastward, the Committee will understand we have little or no sea on the beach in easterly winds: we are so protected by the South Foreland, that there is no sea.

[Ques. 1600.] Will you state to the Committee your opinion of the works now in progress?—I certainly have given this plan a great deal of consideration, probably as much as any person in Dover; and the Committee must understand that the ebb-tide makes a little before high water and runs to the westward, taking the harbour-tide with it, which, in my opinion, assists in *preventing* the beach from *passing across* the harbour's *mouth*. Now, if the south head was run out far enough to bring the *true tide home to it*, it would then, in my opinion, throw the beach across the harbour's mouth to the northward: at the same time, if this head was so carried out it would also *protect* the entrance of the harbour from the *heavy sea* that now comes in, which prevents vessels in distress attempting it in bad weather.

[Ques. 1601.] Suppose such a result was to follow the extension of the pier, are you sufficiently acquainted with the beach on the north side of the north pier to know what the effect would be upon the portion of the town that is built there?—*I do not think it would alter it at all: I do not think it would make any difference. That is my opinion; because if you look at the jetty which we have to the eastward, which was run out about fifty feet two years ago, there you see the beach lying close home at that point; and directly it rounds that point, it again comes inwards, and travels eastward as before.*

[Ques. 1602.] Is there not a constant supply of beach which accumulates in the bay?—Yes; but the accumulation of the beach in the bay must depend upon circumstances to the westward of Dover harbour.

[Ques. 1604.] Might not running the pier out to a considerable extent, such as you have proposed, have the effect of preventing that supply?—*No, I think not:* but when I said the bay would be endangered, I am looking to the *possibility* of the falling of Shakspeare's Cliff—*any thing* that would prevent it for a considerable time coming, say a winter or two, *would certainly* do so.

[Ques. 1615. *Chairman.*] You have stated an opinion that the collection of sand at the mouth of the harbour might be prevented by running the harbour out for 50 or 60 feet?—My reasons for wishing that to be run out is not only for the

purpose of throwing the beach clear of the head, but also to make the harbour *accessible in a gale of wind*, which is not the case at present even if there is *no beach*; the Committee must clearly understand that as a *positive fact*.

[Ques. 1616.] You think such an extension of the south head would make it accessible at all times?—I think so; it would so far *protect* the north head and mouth of the harbour from the *sea*, as to allow vessels to enter in *security*.

[Ques. 1617.] Are you decidedly of opinion that the beach would not accumulate if the south pier was run out to the extent you propose?—Yes, I really am: *it is my decided opinion*.

[Ques. 1664.] If I understood you right yesterday, it formed part of your plan in carrying the pier out, that it should be on piles, or at all events an open pier?—Yes.

[Ques. 1665.] The object, I apprehend, in having open piles will be to allow the sea to exhaust its force in the piles, or in its works, previous to its finding its way into the harbour; and that, in your opinion, would diminish the great swell that at present exists in the harbour?—Yes, *most certainly*. It is now *perfectly impossible* for a vessel to enter Dover harbour as a place of *shelter*, even if there was *not a shingle* before it. I believe you will find there is not one individual in Dover but what is perfectly satisfied that the outer harbour is almost ruined.

[Ques. 1736. Sir *John Reid.*] You never have seen either East or West Indiamen in Dover harbour?—No.

[Ques. 1737.] Do you think it might be made capable of receiving them?—It depends upon the tonnage of the ships.

[Ques. 1738.] Five hundred tons?—Five hundred tons might enter Dover harbour.

[Ques. 1739. Mr. *Majoribanks.*] Did you ever have a ship of 500 tons in Dover harbour?—I think I recollect, when a boy, a vessel of 700 tons coming in.

[Ques. 1740. Sir *John Reid.*] My object for putting that question was for the purpose of *increasing, if possible, the trade of Dover?*—I should say that a vessel of 500 tons could enter the Dover harbour, no question about it, if the *entrance* was made *good*.

Mr. WILLIAM PRESCOTT, called in; and examined.

[Ques. 835. *Chairman.*] You are an inhabitant of Dover? —I am.

[Ques. 836.] You have resided there for a good many years? —Eleven years.

[Ques. 837.] And are well acquainted with the harbour and port of Dover? —I have made it rather a study for many years, paying marked attention to it.

[Ques. 894. Sir *Edward Knatchbull.*] You suggested plans of your own?—As I stated before, I laid them before Mr. Jenkinson, and asked him if there was anything which he or Mr. Moon might think worthy of consideration. If they did (Mr. Moon was ill at the time,) I would be very happy to explain my opinion upon them. You are aware it was the *prolongation* of the *head,* and as I stated at that time to the commissioners, relying in clearing the harbour's mouth by mechanical means by a sluicing power, that they must have a power greater than the resistance. But I questioned the propriety of relying on the sluicing power at all until they had tried the experiment as recommended by the engineers who had been applied to, Mr. Smeaton, Mr. Rennie, and Mr. Walker.

[Ques. 895.] You had perfect confidence in your own plan and no confidence whatever in this of Mr. Moon? —I could not have any confidence in his plan; and if the principle which has been laid down by practical engineers was correct, *that of bringing the tide past the entrance of the harbour, instead of checking it, as it is now checked, at the south head, occasioning a counter-current where there ought to be a true current,* then of course under such a qualification I must have approved of a plan which in my judgment would have carried the *true tide to that point, and prevented any accumulation at the pier head,* because no gentleman ever saw an *accumulation* at the *end* of the *stone-head.* The cause is therefore obvious.

[Ques. 896.] Then at the time you submitted your plan you had perfect confidence in the success of it? —I told his Grace the Duke of Wellington at that time, "Far be it from me attaching any importance to them whatever:" but he asked me what would be the result of such a power if such a power

was obtained. I said the power then obtained would be to remove that bar in ten minutes, which there is no question it would.

[Ques. 1000. *Chairman.*] Is it your opinion the *extension of the south-head wall* would be the best plan to prevent an accumulation of shingle?—It is.

Mr. PHILIP GOING, called in, and examined.

[Ques. 1475. *Chairman.*] Are you an inhabitant of Dover?—I am.

[Ques. 1476.] Are you a shipowner there?—Yes.

[Ques. 1477. Mr. *Fector.*] How many years have you been resident in Dover?—Sixteen years.

[Ques. 1478.] Has your residence during those 16 years been near Dover Harbour?—It has.

[Ques. 1479.] Have you, during that period, paid considerable attention to the harbour?—I have frequently.

[Ques. 1480.] On account of being very much interested in the commerce with the port?—Yes.

[Ques. 1481.] Will you have the goodness to state to the Committee any observations you have made during the period as to the effect of the different alterations and improvements of the harbour?—The principal observations that I have made lately is the difference in securing ships in the *inner harbour* or basin in consequence of so *much swell,* which has been occasioned by the contraction of the outer harbour, causing it to roll in at the great gates.

[Ques. 1482.] By what has that contraction of the outer harbour been occasioned?—By the enlarging of the old cross-wall.

[Ques. 1483.] What was the reason for enlarging the old cross-wall?—It has been made a straight wall: before it had a place for the *sea to break.*

[Ques. 1487.] Have you at any time heard masters of vessels complain of the fact, which you formerly mentioned, of the contraction of the outer harbour; men who have been in the habit of frequenting Dover Harbour either when wind-bound or when detained to discharge their cargoes?—Yes, frequently; and I have the names of several ships that received damage since this alteration.

[Ques. 1488.] Have you not a statement of that fact, signed by several persons on that station?—Yes; there is one in December and one recently.

[Ques. 1489.] Do you know of any of those particular facts stated in this document?—I saw several of them myself.

[Ques. 1490. Sir *E. Knatchbull.*] Do you yourself know anything of the fact?—I have seen *great damage done.*

[Ques. 1499. Mr. *Fector.*] Do you ever remember vessels to have sustained any considerable damage after they had entered the harbour in safety?—Yes.

[Ques. 1526.] Since the enlarging the new quay or the cross-wall, have you noticed any alteration in that part of the harbour?—I have.

[Ques. 1527.] Will you have the goodness to state to the Committee what alteration you have noticed?—We find much more difficulty in *holding* our ships in the *upper pent,* and are compelled to get our *chains* out, when formerly we used only *hawsers* or *small ropes.*

[Ques. 1528.] In short do you consider the harbour was more safe and more secure before the recent alterations than it has become since?—After the ships had entered the port.

[Ques. 1529. Mr. *Majoribanks.*] Did you ever know of a ship receiving serious damage on coming into Dover Harbour?—*I lost one myself, the 7th of last October : it was condemned and sold as a wreck.*

[Ques. 1530.] You have heard of others?—Yes.

[Ques. 1531.] Do you recollect the instance of a ship called the Mars, Captain Keane, 300 tons burthen, laden with tobacco, from Virginia to Amsterdam, that she received so much damage that she was afterwards condemned, and her cargo shipped aboard a Prussian vessel. Do you recollect the circumstance?—Yes.

[Ques. 1532.] You have known also of other vessels being condemned?—Several.

Mr. DANIEL PEAKE, called in; and examined.

[Ques. 590. *Chairman.*] You are a Cinque-port pilot?—Yes.

[Ques. 591.] How long have you been so?—*A little more than* 40 *years.*

[Ques. 592.] Which of the Cinque Ports are you attached to?—Dover.

[Ques. 593.] You are well acquainted with the harbour of Dover?—I have known it between 50 and 60 years.

[Ques. 594.] You have been in the habit of piloting ships in the Downs?—Yes.

[Ques. 595.] Have you had occasion to make use of Dover Harbour as a harbour of refuge?—Yes.

[Ques. 596.] Coming which way?—From the westward; sometimes from the eastward.

[Ques. 597.] What is your opinion of Dover Harbour as a harbour of refuge?—It is a very safe harbour; there is a little difficulty in getting in, but it is the best low harbour, in my opinion, in England; *the difficulty is in the entrance.*

[Ques. 598.] There is a difficulty in the entrance, from the occasional accumulation of beach?—*There is.*

[Ques. 599.] In piloting a vessel from the westward, with a strong wind from the south-west, is it safe to make for Dover harbour?—It is safe if it does not blow *very hard.* Sometimes when it blows very hard there is a *heavy sea* there; and so there is at all open places.

[Ques. 600.] Suppose you were taken in a heavy gale from the south-west, would you rather run for Dover or for Ramsgate?—At particular times, *if* there is no *bar* before Dover harbour, I should run for Dover harbour.

[Ques. 601.] Suppose you had been to sea for several days, what would you do?—I should know by the flag what water there is.

[Ques. 602.] If there was draught enough of water you would make for Dover harbour?—Yes, because I know it well: it would *frighten* people that did not know it well.

[Ques. 603. Mr. *Majoribanks.*] Do the Cinque Port pilots generally know it as well as the Dover pilots?—Yes.

[Ques. 604. *Chairman.*] Do coasting vessels that do not take a pilot on board, make use of Dover harbour as a harbour of refuge?—Yes; but it is *not safe* for them without they had a pilot on board.

[Ques. 605.] The bar shifts to such an extent that it is impossible to lay it down with such accuracy in the chart that any vessel passing might use it as a harbour of refuge without

a pilot?—It is not advisable to use it without a pilot, because the bar *shifts so frequently*.

[Ques. 606. Mr. *Elphinstone*.] Coasting vessels do not have pilots?—They are not compelled to have pilots.

[Ques. 615. Mr. *Plumptre*.] Do you think if a breakwater had been formed at the mouth of the harbour, that that would have had the effect of permanently stopping the accumulation of beach?—No, I should be *frightened* out of my *life* at a *breakwater*.

[Ques. 621. Mr. *Majoribanks*.] You have stated that a pilot knowing Dover harbour would have no difficulty in taking a ship in there if it blew strong from the south-west, Now, an outward-bound ship frequently lands her pilots in the Downs. Suppose a ship leaves her pilot in the Downs and goes round to Dungeness, and there is a strong gale, would it be safe for her to attempt Dover harbour?—*No, nor Ramsgate*.

[Ques. 622.] It would not be safe for a ship, having left her pilot in the Downs, with a strong gale from the south-west, to attempt making Dover harbour?—*By no means*.

[Ques. 632. Mr. *Dundas*.] Whom do you consider judges of the state of the habour?—*Nautical men*; in particular the *outer* part of the harbour.

[Ques. 634.] When you said a breakwater would not answer, where did you mean it to be?—Beyond the outer part of the pier.

[Ques. 639.] If you had a breakwater you would then run under that in preference to running into the harbour?—No, I would have nothing to do with the breakwater.

[Ques. 640. Mr. *Plumptre*.] Have you seen any of the other plans for the improvement of Dover harbour?—No, I have not seen any plans. I was much pleased since I have seen the plan that they have been now at work upon; and I have made up my mind that, *so far as that goes*, it will have the desired effect; and I was satisfied that would do; and if that will not do, nothing, I think, will do.

[Ques. 641. Mr. *Majoribanks*.] You are satisfied that if that plan does not answer, no plan that can be suggested would probably answer?—That is my opinion; and I should say you may *put down* the *breakwater* after that.

Mr. ROBERT HAMMOND called in, and examined.

[Ques. 1352. *Chairman.*] What is your profession?—I am a warden of the pilots of Dover.

[Ques. 1353. Mr. *Fector.*] How long have you been at sea;—I have been at sea forty years.

[Ques. 1354.] Were you ever in his Majesty's navy?—Yes.

[Ques. 1355.] In what capacity did you serve? —I was 18 years in his Majesty's service as master of H. A. vessels, and a Cinque port pilot: pilot in vessels from first-rate ships of war to a cutter, cruising in the North Sea and Baltic Sea during the war.

[Ques. 1356.] How long have you been a pilot?—I have obtained a licence 29 years: I was an extra pilot in his Majesty's service nearly two years before I obtained that licence, and have now been a Cinque port pilot 29 years.

[Ques. 1357.] You are well acquainted with Dover harbour?—Yes, I think I ought to be; I have known it for the last 40 years and upwards.

[Ques. 1358.] Were you ever a master or mate of vessels frequenting that harbour before you were a pilot?—Yes, I was mate of passage vessels and master of hired armed cutters, and a mate in a revenue cutter on the station; frequently in the harbour and out.

[Ques. 1359.] From your knowledge of Dover harbour, and so many years as you have conducted vessels in and out, will you state to the Committee your opinion as to whether the harbour is better and more safe now than it was 40 years ago?—*I should say decidedly not.*

[Ques. 1360.] Do you think it less safe?—*Certainly.*

[Ques. 1361.] Then you do not consider the alterations which have been made since you got to sea have proved effectual?—*Certainly not.*

[Ques. 1362.] Will you state in what respect?—In consequence of a stone wall which has been built across the outer harbour to make a basin and dry dock, and from the recent extension of the cross-wall; it has so curtailed the outer harbour that it is almost impossible for vessels now to lie in safety, whereas formerly there have been laid 20 or 30 vessels.

[Ques. 1363.] How does that arise?—I think it proceeds

from curtailing the harbour by building those cross-walls and extending them.

[Ques. 1364.] The late alteration has, of course, curtailed the harbour materially?—In fact the swell of the outer harbour was less formerly, because there was more room for it to expand itself; whereas it is now so confined by the stone walls, that the sea has *no place* to expand.

[Ques. 1366.] Is it not a matter of complaint amongst masters of vessels that they have not sufficient room to shoot in the outer harbour?—Yes, it is a general complaint.

[Ques. 1367.] Have you at all turned your attention to the improvement going on at the south pier head?—Yes, I have.

[Ques. 1368.] As a practical man?—Yes.

[Ques. 1369.] Is it your opinion the alteration going forward at the south pier will have the effect of keeping the harbour always clear of the bar, and not preventing vessels entering in and out; and will you have the goodness to state your opinion to the Committee in this respect?—I never shall differ from my opinion in that respect: I have given it frequently on the pier head, and I shall give it here candidly. I do not think it will have the desired effect any further than keeping the shingle from off the apron they are putting down, and in consequence of which the beach will form from off that apron in the way it does now: of course the remedy will be worse than the disease, because the bank that forms outside will accumulate there until a strong gale comes from the south-south-west, which will then force it into the entrance, as it now does.

[Ques. 1370.] In fact the bar will then be more dangerous to vessels, and more prejudicial to the harbour than it is now?—It will be more prejudicial to the vessels coming in.

[Ques. 1371.] Will it be more or less difficult to cut through the bar in that state than it is now in its present state?—Most certainly; they will not be able to get at it so well, it will lie so far out.

[Ques. 1372.] Do you not think that the south pier-head is so formed as rather to invite the shingle into the harbour for the accumulation of the beach?—Yes; I should call it a complete *shingle trap*, and that is the general opinion.

[Ques. 1373.] That is the general opinion of practical seafaring men?—That is the general opinion of nautical men who walk the pier-head daily: the pier-head lies in a south south-west direction: the beach comes from the westward.

[Ques. 1374.] Then is not the north head, in your opinion, so formed as to catch the beach?—Yes; it comes direct from the south-head to the north-head, in consequence of the heads being nearly in a line; lying in a south-south-west direction.

[Ques. 1375.] State to the Committee, as a practical man, what is your opinion as to the accumulation of shingle at the south pier-head?—In consequence of the strong prevalence of westerly winds, which we have nine months out of the year, the beach rolls along with the flood-tide from the westward along the shore, which brings the shingle down to the eastward towards the stone pier-head until *it meets a counter-tide from the bay, in an opposite direction to that of the western flood tide.* The beach then comes round this stone-head into this counter western tide and causes the beach to *drop*, and which I have observed the formation of for a number of years. There it lies and accumulates, just to the southward of the south pier head. When we have a strong gale of wind in from the south-south-west, this bank that has accumulated between these two tides is then drove into the mouth of the pier, and blocks it up.

[Ques. 1376.] Do you think that if the south head was differently formed, and run out 50 or 100 feet, it would remedy this evil?—*Yes, I do: that has always been my opinion.*

[Ques. 1377.] Do you think the removal of Cheeseman's Head has been of advantage, or of prejudice to the harbour?—Prejudice.

[Ques. 1378.] In what respect?—I think there has been a greater accumulation of beach since the head has been shortened than there was before.

[Ques. 1381. Mr. *Marjoribanks.*] If you have got a vessel into the outer harbour of Dover, the ground there being generally harder and uneven, where would you place her?—I should not allow her to remain in the outer harbour at all, when there was a possibility of getting her into the inner basin.

[Ques. 1382.] If there was no possibility of getting into the inner basin, what would you do?—If there was no possibility of getting her into the inner harbour, in consequence of the *gates being shut*, I must lay her where I can get a berth: it is immaterial where I lay her, for the ground is all of the same kind, with the exception of the east side.

[Ques. 1383.] Putting yourself in the situation of an owner of a vessel, you would not consider her safe in the outer harbour of Dover, with a strong wind from the south-east or south-west?—No.

[Ques. 1384.] Can vessels at all times get into the inner harbour?—No, it frequently happens vessels come in when the gates are shut.

[Ques. 1385.] It does not answer the purpose of a harbour of refuge?—*Not in its present state.*

[Ques. 1386. Mr. *Fector.*] Do you not consider it quite susceptible of improvement?—*Yes, I do.*

[Ques. 1387. Mr. *Elphinstone.*] Do you think, from your knowledge of the coast, if coasters are going up and down the channel, when they in any case have occasion to go into Dover harbour, would they not in bad weather rather put into Ramsgate?—In many cases I should prefer taking Ramsgate harbour to Dover.

[Ques. 1388. Mr. *Marjoribanks.*] In coming from the west?—Yes: if I am away for four or five days, I should not know how the bar is situated: no person that leaves Dover three or four days can account for the bar.

[Ques. 1389.] Therefore as a harbour of refuge it is inferior to Ramsgate?—Yes, it is, in its present state.

[Ques. 1472. *Chairman.*] You stated, I think, in your evidence, that vessels would, in general, rather make for Ramsgate harbour than for Dover: is that in consequence of the bar that lies at the mouth of Dover harbour so frequently?—Yes.

[Ques. 1473.] Were that bar removed, and were there no such impediment as now exists, would Dover harbour then be as good a harbour of refuge as Ramsgate?—Certainly. It is only the bar that has rendered Dover harbour not so good as Ramsgate. Dover harbour is better than Ramsgate when a vessel is once in.

[Ques. 1474. Sir *Edward Knatchbull.*] You consider it of great importance to maintain Dover harbour?—Yes.

Mr. JOHN BENJAMIN POST, called in; and examined.

[Ques. 516. *Chairman.*] You are a pilot at the Cinque Ports?—Yes.

[Ques. 517.] How long have you been a pilot?—I was seven years a pilot for the public service in the navy, and 24 years as a pilot for the merchant service.

[Ques. 518.] Are you well acquainted with the harbour of Dover?—Yes: I have made it my amusement in particular, observing the rise and fall of the water, or the flowing and ebb of the tide with the motion of the beach, the last 20 years.

[Ques. 519.] You are, consequently, able to speak of the state of the harbour at present, and what you have known it during that period?—I think I am.

[Ques. 520. Will you look at the model of the harbour before the Committee?—I have seen the model once before.

[Ques. 521.] Will you state to the Committee what are the great defects of Dover harbour?—From the want of more water coming down through the harbour to scour the beach clear at its mouth.

[Ques. 522.] What is there to scour away?—The beach generally collects under the south head; the south pier-head acts as a nucleus for the beach to gather under it, and it forms a large ridge of beach across at the mouth of the harbour. *I have seen it driven* 40 *feet within the point of the north head,* 15 feet high at the south-head, declining to 12 feet nine inches at the north head. The harbour became completely blocked up at that time: it was the largest bar that ever I saw formed at Dover. It had been blowing very heavy, for four or five days previously, from the south-west, which is the wind that produces *most sea* before Dover harbour, and consequently the *most beach.*

[Ques. 523.] When was this?—This was in December, 1824. With the permission of the Committee I will read the remark I made at the time. December the 1st, 1824, the bar of beach at the south pier-head was 15 feet above the apron, and stretched across to the north pier-head, declining

to 12 feet 9 inches, and 40 feet within the north head: a trench was made in the bar at low water, and all the sluices simultaneously opened on the bar. The effect was, the principal part of this immense body of beach was removed from the harbour's mouth in one hour, and the following tide, a French ship, of 240 tons register, drawing 12 feet, entered the harbour without difficulty, and at the lowest neap tides.

[Ques. 524.] This was the largest accumulation of beach that ever you saw?—The largest that ever I witnessed. It was a complete block; not a nut-shell could float in or out.

[Ques. 525.] You say that the accumulation of beach chiefly occurs with the wind blowing from the south-west; does the wind blowing from any other point produce any accumulation of beach?—None but westerly winds.

[Ques. 526.] It is a frequent occurrence that an accumulation of beach is produced in the mouth of the harbour?—*Very frequent.*

[Ques. 527.] Have you known the harbour frequently closed during a tide in consequence?—I have to vessels drawing more than 10 or 12 feet water; *I have known it closed in one tide,* in a heavy gale of wind from the southward.

[Ques. 528.] You stated that this great accumulation was entirely removed in one hour; were the works then in the state in which they were before the present improvements were commenced?—Yes, it was 12 years ago since I saw that immense bar; it was cleared by a trench being cut in the shingle in a direct line, in and out of the harbour, about south south-east.

[Ques. 529. Mr. *Plumptre.*] Was it done by manual labour, or by plough?—*By plough and manual labour both.*

[Ques. 530. *Chairman.*] Did this occur at the period when the works were in the state in which they were previous to the commencement of these improvements?—Yes.

[Ques. 531.] If that great accumulation was removed with such apparent facility in only one hour, what is there to make it appear necessary to undertake this great additional alteration in the works?—When that accumulation was removed, it was owing to the back-water being discharged all at one

period into the outer harbour. We had water to the depth of eleven feet penned in within the bar, with the additional back-water united with it: it rose into the trench, which was cut sufficiently deep; and in the course of an hour the main body of the bar of beach was removed.

[Ques. 532.] From that, it would appear that when the harbour is entirely choked up, it would be more easy to remove the shingle than when it is only partially choked up?—*That has generally been the case.*

[Ques. 536.] How many feet is the low-water mark beyond the end of the works?—The lowest tide that ever I have measured beyond or without the present work is 300 *feet*, and three feet six inches vertical fall or depth below the apron; but upon an average between mean low-water neap tides and mean low-water spring tides, the apron lies about at the level of mean low-water mark; that when those sluices from the south pier are discharged upon that granite apron, the force is so great that no beach or shingle will lie on it, but will be forced off like chaff before the wind.

[Ques. 537.] It is your opinion that any accumulation that may be formed and washed off by the sluices at the expiry of one tide, will be removed entirely away from the mouth of the harbour?—I have no doubt of it.

[Ques. 538.] When you speak of the apron, you mean the apron that is to be formed upon the new works?—I do.

[Ques. 539.] You are acquainted with the whole navigation of that part of the coast of Kent?—Yes.

[Ques. 540.] Have you been in the habit of piloting ships into Dover harbour?—*No*; but along the coast under the jurisdiction of the Cinque Ports. I have not been driven in distress into Dover harbour.

[Ques. 541.] Suppose you were on board a vessel in distress, would you consider it safe at low tide to run into Dover harbour?—I should with the wind at north-east, which is the wind that would carry you into Dover harbour from the Downs. But Dover harbour is such that you *cannot depend upon the bar from one tide to another, if you are absent from it twenty-four hours; and therefore we often prefer lying at sea rather than attempt Dover harbour.*

[Ques. 562. Mr. *Fector.*] Supposing a breakwater were

thrown out, at or near Shakspeare's Cliff, then the shingle would be prevented from accumulating at the mouth of Dover harbour?—It would, for two or three years; but eventually it would fill on the western side, the progress of the beach being from the west to the east, in consequence of the prevailing wind from the west to the east, and it usually travels in that way: no tide has any influence upon the beach.

[Ques. 563.] Then if a breakwater were thrown out at or near Shakspeare's Cliff, you think that, for two or three years, the accumulation of shingle at the mouth of the harbour might be prevented?—Yes.

[Ques. 564.] What is to prevent, at the end of those three years, an additional length of breakwater being thrown out, that would prevent it for three years more?—Yes, it would; but you cut off the supply of beach, and endanger the property in the bay.

[Ques. 565.] Therefore the great objection to running out a breakwater from Shakspeare's Cliff, and thereby preventing an accumulation of shingle there, is the injury which the property in the bay might sustain?—*Decidedly.*

[Ques. 578.] Do not you think that, by enclosing the cross wall, the outer harbour, as a place of refuge in bad weather, has been considerably injured?—I do; I think it has circumscribed the outer harbour, much to the injury of it.

[Ques. 579.] Did not vessels, before that plan was adopted, lie in perfect safety in the harbour?—They did.

[Ques. 585. Mr. *Goulburn.*] Do you consider that there is sufficient accommodation for vessels in the outer harbour of Dover?—There is sufficient accommodation to lie there without any danger or risk of damage in *moderate, but in bad weather quite the contrary in the outer harbour.*

[Ques. 586. Mr. *Marjoribanks.*] They cannot lie in safety there in bad weather?—*By no means,* not in the outer harbour.

Mr. ISAAC PATTISON called in, and examined.

[Ques. 1879. Mr. *Fector.*] What is your occupation?—I am a boatman.

[Ques. 1880.] Are you not otherwise connected with the harbour?—I am a licensed boatman, and a harbour pilot, 16 years.

[Ques. 1881.] Were you a boatman previously to your being licensed?—I have been a boatman, and licensed, altogether 30 years.

[Ques. 1882.] Have you been acquainted with Dover harbour during the whole of that time?—Yes.

[Ques. 1883.] Do you think, as a practical man, the alterations that have been made from time to time have improved the harbour?—No; they have been all for the worse.

[Ques. 1884.] Will you state your reason?—In the first place, there is no berth in the harbour to lie a ship.

[Ques. 1885.] That is the outer harbour?—Yes.

[Ques. 1886.] Is that in consequence of the new works?—Yes, of course it is; there is no room to shoot a ship.

[Ques. 1887.] Previously to the late improvement the outer harbour was perfectly secure?—Yes.

[Ques. 1888.] Have you ever heard complaints of the state of the outer harbour on the part of masters of vessels?—Yes, many times.

[Ques. 1889.] Do you ever remember any accident occurring in consequence of the contraction of the outer harbour?—Yes, many. It was not many years ago there was a brig knocked all to pieces in the outer harbour, and she was condemned.

[Ques. 1890.] Then, in fact, would you not, if you were in charge of a vessel, almost as soon remain in the bay as pilot her into the outer harbour under the present circumstance?—*We never think about running for Dover harbour if it blows hard from the westward.*

[Ques. 1891.] That is in consequence of the bad state of the outer harbour?—It is in consequence of the *sea on the bar*, and *the uncertainty of the water*, which places a *great difficulty* and *responsibility* on the pilot.

[Ques. 1910. Mr. *Goulburn.*] You say you object to take vessels into Dover harbour from the shortness of water and the uncertainty of getting in?—Yes.

[Ques. 1911.] Has that not always been the case at Dover harbour?—Some years ago there did not use to be near the quantity of bar there is now.

[Ques. 1912.] What time is that?—Thirty years ago.

Mr. BENJAMIN WORTHINGTON called in, and examined.

[Ques. 1817. *Chairman.*] You are an inhabitant of Dover?—I am.

[Ques. 1819.] And a lieutenant in the navy?—Yes.

[Ques. 1819.] You have been resident there a considerable number of years?—I am a native of Dover. Excepting when I have been in the service, I have generally made Dover my home since the peace. For the last five or six years I have been entirely confined to Dover.

[Ques. 1820. Mr. *Fector.*] Have you had frequent opportunities of makind observations on the works of Dover harbour?—I have known Dover harbour for these last thirty years: I have a perfect recollection of it, and have witnessed and known the whole of the works that have been added from time to time.

[Ques. 1821.] Has your attention been more particularly drawn to it lately?—More particularly lately, having had considerable interest in the prosperity and welfare of the place.

[Ques. 1824.] Do you recollect the state of Dover harbour many years?—Yes; thirty years I have known Dover, and have a perfect recollection of it.

[Ques. 1825.] Do you consider what has been done during the last thirty years has improved the harbour?—Decidedly not: I do not know of a single work that has been carried on that I can really say has improved the harbour. We are as subject to a bar now as ever we were, and I consider the natural qualities of the harbour to have been quite destroyed. It was formerly known, even to a proverb, that Dover harbour, as a dry harbour, when once entered, was the safest harbour in England; but its qualities are now entirely superseded, from its being surrounded by perpendicular walls. And formerly the original state of the harbour in the south-west side formed a bight, a sort of bay, which was surrounded by the beach, and this beach caused the swell to be subdued in the harbour. It was placed for it to fall into and to become exhausted: not only that, but it was a very convenient and safe place for vessels taking refuge to moor in; and it has also rendered the harbour dangerous for vessels to enter by thus being contracted.

[Ques. 1826.] Is there no convenient and safe mooring

place for vessels now in that part of the harbour where this bight was?—No captain of a vessel knowing the harbour would attempt to moor his vessel in the outer harbour.

[Ques. 1827.] For what reason?—It is impossible to get mooring-ropes to hold them: even their chain-cables have been known to part. It is not more than six or seven weeks since a Yarmouth brig capsized her windlass, which is not a common occurrence at sea: but this was the case; and a vessel lying by the side of her fell to the leeward on board of one of the quays, and got very much injured.

[Ques. 1828.] Did vessels formerly even prefer lying in the outer harbour, to going into the inner harbour?—Vessels taking refuge hardly ever went into the inner basin: they used to lay in tiers, in what was called the Green Fields: that is the space now occupied by the dock-basin and dry dock.

[Ques. 1829.] Would it be advisable for them to do that now?—No master of a ship, indeed I should say the harbour master himself, would suffer a vessel to be there unless she could not be got into the basin.

[Ques. 1830.] What is the use of this dock-basin?—It is to increase the backwater, and to supply the reservoir to the south pier.

[Ques. 1831.] Is it used for no other purpose?—Vessels are occasionally moored in the dock-basin; but still it is not a safe place: there is so much range, unless shut in with the gates; but that is so expensive that every master of a vessel does not like to go to.

[Ques. 1832.] Do you know any other harbour except Dover harbour where a beneficial result arises from that condition of the harbour which you mentioned was formerly the state of Dover harbour before the perpendicular walls were erected?—Calais harbour is constructed in that way. There is a beaching-place on the south-west side of Calais harbour. Calais harbour is completely open to the north-north-west; and in gales of wind a very heavy sea rolls into the mouth of the harbour; but owing to there being a space, a sand called the Gun Bank, on the south-west side, which breaks the swell, a vessel was never known to break her moorings alongside of Calais quay.

[Ques. 1833.] You have spoken of the strand surrounding

the south-west portion of the outer basin; what has superseded this strand?—The dock and the dock-basin.

[Ques. 1834.] In your opinion, has the construction of this dock and dock-basin been attended with injurious effects to the harbour, or not?—Certainly it has a very great injurious effect on the harbour.

[Ques. 1835.] Still, is it not necessary that a port situated as Dover is, should have a dock?—Certainly; but it is thought a much more eligible place might have been provided in the basin. To a seaman's view of the harbour, it ought never to have been circumscribed.

[Ques. 1836.] Have you ever observed that the harbour was unsafe to enter in heavy gales of wind?—Certainly; very unsafe.

[Ques. 1837.] You have yourself personally observed it?—Yes.

[Ques. 1838.] You have frequently found it was almost impossible for vessels to enter?—It is, occasionally.

[Ques. 1839.] State your opinion of the cause of the difficulty of entering Dover harbour? Vessels of any burthen in entering the harbour would not require more than three minutes from the time they entered the pier-head before they are in close to the upper part of the harbour. And in that short space of time it is impossible, perhaps, in winter time, the running ropes and sails stiff with frost, and crew exhausted with fatigue, to stop a ship's way in that distance: they cannot brace their yards and shorten sail with that activity which is required; and very often, which adds to the difficulty, there is a foreign crew for an English pilot to communicate his orders to.

[Ques. 1840.] That is to say, there is not sufficient room in the outer harbour for vessels to shoot?—There is not. It is the custom of some to let go an anchor, but it is to very little purpose.

[Ques. 1841.] Do you think these difficulties could be overcome?—They could be overcome by a beaching-place. I think Dover harbour wants a beaching-place when ships come in in blowing weather, and unmanageable.

[Ques. 1842.] Would a beaching-place not have the effect of diminishing the swell?—Certainly.

[Ques. 1843.] Your observations have hitherto referred to the outer harbour; can you inform the Committee what is the state of the inner basin?—It remains much in the same state I ever remember it, with the exception of some little improvement to the quay: the quays have been rebuilt and repaired.

[Ques. 1844.] Do vessels lie with the same safety in the inner basin now that they did formerly?—Certainly not.

[Ques. 1845.] What is the reason of that?—From the swell that rolls in through the gateway; from the harbour being so constructed, it is difficult to shut the gates under these circumstances.

[Ques. 1846.] Does it frequently occur that the basin becomes very much crowded with shipping?—Very much.

[Ques. 1847.] Does any inconvenience result from the inner basin being too much crowded with shipping?—Vessels lay in tiers, and if a hinder vessel should take an inside berth, and the outside ones were to press against her, it would cause her to be injured. I recollect one circumstance last winter, of a collier being hung up: she was jammed between two vessels, and was suspended. As the water ebbed she suddenly fell through, and became very much injured.

[Ques. 1848.] Is there no other accommodation for vessels to be in, excepting the basin?—There is the pent.

[Ques. 1849.] Do vessels, when the inner harbour is in this crowded state, ever avail themselves of the advantage of going into the pent?—Not often; there is not water through the bridge-way to get into the pent: there is four feet less water in the pent gateway than in the harbour's mouth, and three feet six inches less than in the gateway at the entrance of the basin. If you take eleven feet as the average of the neap-tides, it would leave only about seven feet water to go in, which is a very small draught of water for a vessel to go in, and with a cargo.

[Ques. 1850.] Is the gateway sufficiently wide?—Not for all classes of vessels: we have ten steam-vessels, including the post-office packets, belonging to the port of Dover, and not one of them can pass through that gateway.

[Ques. 1851.] In short, it is hardly possible for any vessel that makes use of Dover harbour as a port of refuge only, to

make use of the pent?—No; you never see a vessel go up there now to take refuge in the harbour: it is very seldom we can get the vessels belonging to the port up there, only in spring-tides: there is so little water through the gateway in ordinary tides, that a vessel drawing any water at all cannot pass through the gateway.

[Ques. 1857.] Do you not think that the harbour is very susceptible of improvement?—I have an idea that it is.

[Ques. 1858.] Have you at all turned your attention to that?—I have.

[Ques. 1859.] Will you prepare a statement of your ideas on that subject, and hand it in to the Committee?—I will.*

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* *The following are Extracts taken from the STATEMENT delivered to the Committee; and which will be further elucidated in a General Description of the Plan and Model.*

It being generally admitted that the harbour requires to be enlarged, I have first given my attention to the remedying this defect, by opening a communication towards the Bay, extending in front of Amherst Battery, and crossing seaward in a line with the York Hotel, leaving a forty-foot road, continuous with the Esplanade and Waterloo Crescent, the two parallel quays from the south-west to the north-east; the one bounding the sea, extending about 700 feet, and the one fronting Amherst Battery about 500 feet, the entrance from the established portion of the harbour about 350 feet, and the return-quay about 350; the two inside walls I purpose being dwarf walls, and to be bounded by a shore of shingles, forming an inclined plane to low-water mark, which would provide a beaching-place for ships to run on when unmanageable on entering the harbour in gales of wind: this would also tend to keep the swell down inside the harbour, which is now so much complained of. This addition to the harbour I fully anticipate would afford an extensive accommodation and security for ships seeking refuge or otherwise, when proper moorings should be established, and the sloping-beach: also, accommodation for ships to lay ashore when requiring temporary repairs.

I beg further to observe, that vessels lying in this addition would not in the least obstruct the fair-way channel of the harbour, as is now the case when moored to the present moorings. The sea wall I purpose to be about 40 feet in thickness, one portion of it to form a quay about 15 feet wide, and to continue on a level with the floor of the pier head, and the remaining 25 feet to form a raised platform, establishing a battery of a very destructive nature, commanding the bay, and giving a cross-fire with the guns in the batteries under the castle. I have also to observe that the space contemplated for the enlargement occupies no property of either description, land or buildings; and I have no doubt but that it will be readily seen that such an extension of the pier would considerably add to the value of property in the town, both public and private; and I take the liberty to mention that, should the plans be thought of such value as to be put into execution, and as part of the work would form a fortification, that Government would be induced to contribute that portion of the expense. And taking a perspective view of the great importance that Dover is likely to attain by a railway communication with the interior of the kingdom, and thereby facilitating the communication with the Continent for the transit of Government expresses, merchandize, &c. and that ships, and other vessels from foreign parts with perishable cargoes, would also avail themselves of this communication of saving time, risk, pilotage, and other contingencies. I must also beg to impress upon your notice that the port of Dover is admirably situated to receive ships bound to the ports of Holland and

[Ques. 1870. Sir *Edward Knatchbull.*] You never made any representation to the Commissioners of Dover Harbour respecting its assumed imperfect state?—Never. *I have witnessed these things, but I have never mentioned it; and I do not know that I should in this instance if I had not been summoned: it is that which induced me to prepare models and plans.*

Flanders, which arrive in the spring of the year, often in great numbers, before the rivers are navigable in consequence of their being blocked up with the ice; and when the time arrives for their departure, a very few hours is sufficient to convey them to their destination. Spithead is at present their place of resort. And adding to this the probable mode of naval warfare, from the introduction of steam, when engaged in a future war, combines to rank Dover as a place of early and deep consideration.

I beg also, in presenting my plan, to observe, that it in no way interferes with the works at present in progress; and further, that it would add much to the benefit of the harbour if the whole were deepened and the gateways widened.

And, with humble submission, I beg to suggest the propriety of a small naval depôt at Dover, from various considerations; and if circumstances were not so propitious I should have hardly dared in times of profound peace to have ventured the suggestion; but at this moment recurs to my mind the good old proverb, "That those who are always prepared for war are most likely to keep peace;" and I think that I should be borne out by all prudent subjects, that we ought at least to keep pace with our neighbours on the opposite coast, who are considerably improving their harbours, fully anticipating the great advantages to be derived from them in the event of a war with England, when who can tell nautical skill may become only a secondary consideration. Dover alone as a packet station deserves a consideration of this nature, where a refitment can be obtained, and stores supplied, without having recourse to a distant port. The spot that I would select for the naval depôt is what is generally known by the "Condemned Hole," and which occupies a space in the basin between the York Hotel and a vacant piece of ground formerly the site of extensive storehouses, which were some years ago destroyed by fire, and have never been restored, belonging to the late John Fector, Esq., and, I believe, now to the present John Fector, Esq., M. P. I have attempted to show the capability of this spot on the plan, as far as capability is concerned. The arrangement of the buildings and architectural designs must be the production of those acquainted with the art. I alone take upon myself the responsibility of suggesting, and it may be the greatest presumption in me even to do that, and it is only the kind favour that you have shewn which has prompted me to do so now. I shall proceed to detail a few of the leading advantages of my proposition. The dock can be constructed in a place formed by nature, without in the least deteriorating or occupying any very important part of the basin, generally being filled with vessels left to decay. The site for the building being occupied by no valuable property, good quays, and approach as regards depth of water, contemplating improvement sufficient for ships and vessels of a sloop of war rating. The whole would form a snug little dock-yard, in a ring-fence; and, from its locality, of no inconsiderable importance.

This, of course, would be a national undertaking; but it would become Government, before it goes into any expenditure of this kind, to see a good harbour established.

For further particulars and dimensions, I beg a reference to a mapped plan of the whole, and model of the pier.

PLAN

FOR THE

CONSTRUCTION OF THE BREAKWATER

AND

APRON FOR THE SLUICES.

—※—

THE Breakwater is intended to be carried out 250 feet into the sea, and to be constructed of balk timber, 1 foot square, of a triangular shape, forming a multiplicity of triangles, each principal or triangle to be tied, or bound together by pieces of timber called whale-pieces, four in number; and to be 6 feet apart, with a ridge purlin, two keels, and two keelsons to strengthen and shorten the bearings of the floor-beams. Four tiers of cross-tie beams, including those for the floor, are intended to connect the principals or triangles with the whale-pieces, by means of strong bolts, and strapped together at the exposed angles with iron.

The principals or triangular pieces to extend below the flooring or platform, in order to give it stability by penetrating the shingle, the inner ends to be longest where the shingle is deepest.

The inside of the frame-work to be planked up with 3-inch plank; about 20 feet at the outer end, and 18 feet at the inner end, and to be caulked water-tight.*

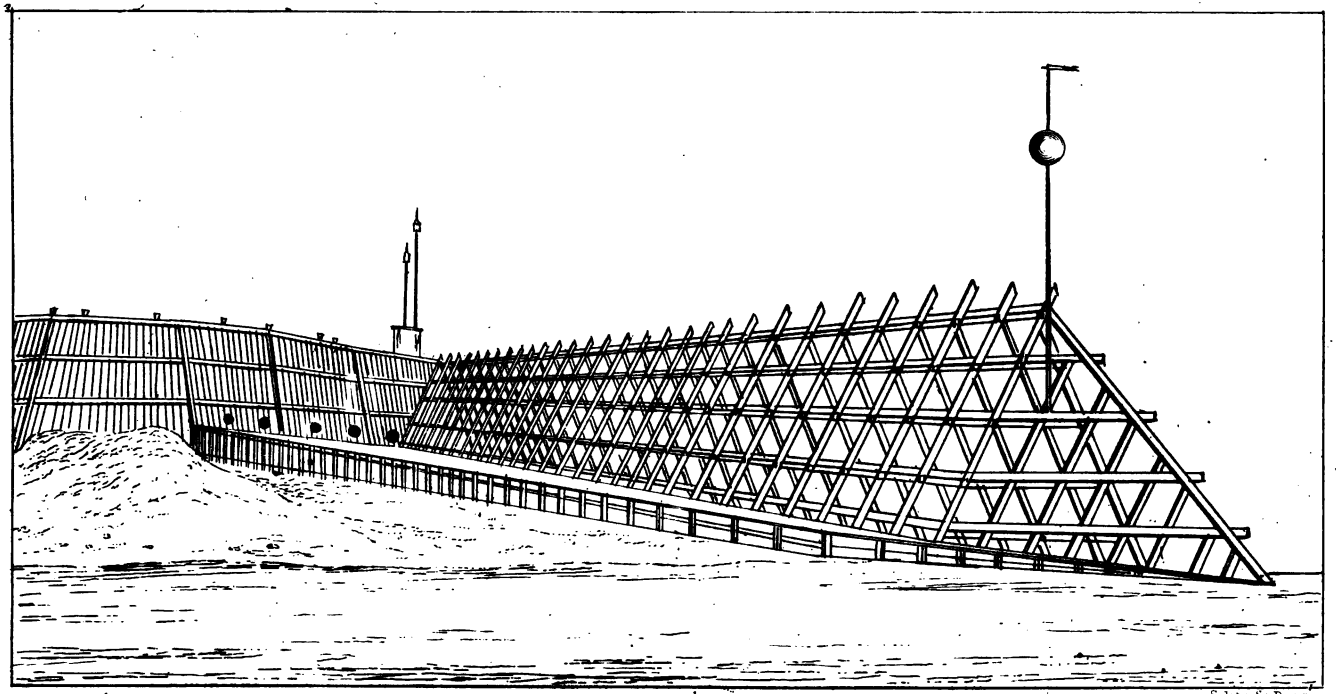
* In the view given of the breakwater, I beg to mention that only the *skeleton* of it is given, as in order to have shewn the planking of it, it would have rendered the whole somewhat confused.

The breakwater could be constructed in two or three divisions, and floated out to its proper position, and grounded by filling it with shingle.

The end of the breakwater to be terminated in an oblique direction.

The frame-work of the apron to extend to the end of the breakwater, and to be formed by driving piles, either of wood or iron, at proper distances, say 5 feet by 14, and covering them with iron or wood; to be highest at the outer edge, so as to form an inclined plane, both towards the breakwater and towards the sea.

The foregoing description of the construction of the breakwater is intended only experimentally, to shew what might be done, and what the effects of the breakwater would be, without the apron, and sluicing power on the west side; as an experiment of the latter could not be tried without its being permanently established, though this would detract one-half from the value of the entire plan. I have given my attention to what might be done experimentally, at a comparatively moderate outlay, because it might be thought hazardous to establish a permanent work without trying what some of its effects might be; and if, afterwards, circumstances should induce the Harbour Board to carry out the other parts of my plan relating to the harbour's mouth, in a permanent work, I consider that the expense of the experiment, would not be thrown away, as the breakwater could be so placed as to form a shield, to protect and afford facilities which could not be obtained without it. On the other hand it may be thought, that there is sufficient evidence to justify a permanent work without first trying an experiment, and more particularly as a very valuable part of the plan could not be tried with the breakwater.



Sclater Sc. Dover.

WEST VIEW OF BREAKWATER AND APRON, SHEWING THE POSITION OF THE CULVERTS.

THE ADVANTAGES

TO BE DERIVED FROM

THE PROPOSED BREAKWATER.

1st. It would shelter the mouth of the harbour.

2nd. It would increase the width of the mouth of the harbour, from 110 to 330 feet.

3rd. It would throw off the Bay eddy, from the harbour's mouth, instead of being allowed to run, as at present, westward, as far as Cheeseman's head.*

4th. It would afford facilities for the ingress and egress of vessels in scant winds.

5th. It would be very useful as a turnwater, in sluicing from the mouth of the harbour, as it would act as a conductor for the water in its proper channel.

6th. It would in a great degree lessen the swell inside the harbour, by preventing the sea from rolling into it.

7th. It would enable vessels, on entering the harbour, to shorten sail as soon as they get into its wake; and give more time to prepare for such contingencies as frequently occur on entering a port.

8th. It would secure a much better launching and beaching place for boats on the west side with easterly winds.

* For an illustration of this principle, see Maps Nos. 1 and 2—Bay eddies.

GENERAL OBSERVATIONS

ON THE

PRINCIPLE OF THE PLAN;

PROVING THE BEFORE-MENTIONED ADVANTAGES.

—✻—

Having thus endeavoured to shew generally the advantages of my proposed breakwater, I shall now endeavour to point out other important ones which would be derived from my other improvements, as well as the peculiar principle of my plan. But I must first premise, that, my observations being intended for the general reader, I have endeavoured to make myself clearly understood, by avoiding the too frequent use of nautical phrases. This explanation I conceive to be necessary, because without it some of my nautical readers might consider that many of my explanations were altogether useless. I think it cannot be denied, that the extension of a breakwater 250 feet beyond the present pier heads, would of necessity shelter the mouth of the harbour—throw off the bay eddy at the extremity of the breakwater, and cause it to unite with the true tide, and thereby assist in carrying the shingle to the north-eastward of the harbour, instead of depositing it, as at present, in front of the north pier head. I ground this opinion on observation: for in no one instance that I am acquainted with, on our coast, does the shingle form a bar either at the extremity or on the east side of any projection into the sea. In proof of this position I beg to refer, as instances, to the Horn of Folkestone, Cheeseman's head, the Castle jetty; and, to those who remember their existence, I

might also refer to the large groins which were formerly placed in our bay, of which I myself have a perfect recollection. The bay eddy would likewise be diverted in its course, and would improve the approach to the harbour, inasmuch as there would then be only one tide, or current, to contend with, instead of two as at present, by this eddy running past the mouth of the harbour, as far as Cheesman's head; and it is generally acknowledged by all acquainted with the present state of the harbour, that the two tides acting upon the starboard bow and larboard quarter of a vessel, render the approach to it extremely difficult, when it is required to bring her to a small helm and a steady course. My plan would also afford much more space for vessels when working to windward, in-shore, from the northward and eastward; and allow them to make longer reaches to gain the harbour, because the bay eddy would be thrown off from the end of the breakwater into the true tide, and thereby give greater space for that purpose, when the eastern tide is running in the offing. This would also enable them to shoot or gain the harbour easier, as they would then have the assistance of the bay eddy.

The direction of the breakwater I propose would be S. S. E.; so that the end of it would bear about south from the north head; and the fair way of the channel being about S. E. it would follow that a vessel could sail the harbour either way with two points to spare. This, therefore, shows that my breakwater would be no impediment to vessels getting in or out with such winds as serve them at present.

I would observe also, that the breakwater would be very useful as a turnwater in sluicing from the mouth of the harbour: for as the shore naturally falls to the westward, the breakwater would act beneficially in stopping the progress of the water in that direction, and in confining it in a body, in a direct course till it reached the sea. It has been proved likewise by observation, that a breakwater sheltering the mouth of the harbour, would, in a very great degree, lessen the swell inside, as this has frequently been observed to be the result whenever a bank or spit of beach has been formed in the same direction as I propose to place it.

A breakwater would also enable vessels, in strong winds, to shorten sail as soon as they get within its wake. It would

likewise prevent the risk of their running against the north pier, or falling behind it; and, by retaining the beach to the westward, the projection would afford shelter and a better beaching and launching place than at present; for it is now difficult, with an easterly wind in the east bay, to launch a boat, owing to the short quick sea which falls upon the shore.

The same advantages would result on the east side of the breakwater with westerly winds, by the adoption of my breakwater: but supposing the plans (said to be in contemplation) for securing the land between the pier and Cheeseman's head, were carried into effect, they would render that part useless; though it is generally known that it was always used for launching galleys before the alteration of the south head. The oblique direction given to the end of the breakwater would cause the flood tide to be thrown further off, for it could not, I conceive, flow round its extremity into the harbour, but would pass it in the same manner it now does Cheeseman's head. The water would flow into the harbour round the north head,* as the young flood does now; and indeed it has always a tendency to do this more so whenever a spit of beach is formed in the position where I propose to place my breakwater. It may be urged by some, that by extending my breakwater into the sea, I should only remove the evil so much farther out, and that a bar would form, with little variation, as it does at present in front of the north head. Others may contend that by the action of the tide, the shingle would be carried rapidly past the harbour and clear of the bay altogether; but these opinions are so much at variance with each other, that the truth of either could only be proved by experiment. My own opinion, however, is different from either: but supposing the effect of the breakwater to partake of both these objections, the result, in my opinion, would be this:—the beach would travel more rapidly past the breakwater, and progress in-shore in a more oblique direction, thereby clearing the mouth of the harbour, as will be shown by the map.†

Another great advantage which would result from my breakwater, would be that by its being extended in a S. S. E. direction, the end of it from the north head bearing about south, would break all seas in its wake running from that

* See Map No. 2. † See Map No. 2, Ref. O.

direction, and to the westward of south. I have also heard it advanced, that it would be no protection to the mouth of the harbour as the seas usually break at 90 degrees or perpendicular from the wind. In other words, that the seas would break right into the harbour, notwithstanding the protection afforded by the breakwater. This opinion, however, is so contrary to all experience, that I have little fear of its gaining ground amongst nautical men, though engineers and their assistants may endeavour to persuade themselves of its truth. That the sea breaks sometimes upon the shore, at an angle deviating from the wind or upon a sudden change, I readily admit; nay more, I can add, that, upon the wind suddenly flying off the land after blowing hard *outerly* from the S. E. the sea will sometimes run even 180 degrees from the wind, but that there is such a variation, with a uniform breeze and in the stream, I confess I have never observed such a phenomenon in the course of my experience. The wind blowing from W. S. W. (the most stream wind) would cross the breakwater at right angles; therefore I presume it would afford shelter during the gales from S. by W. to W. by S. the winds which cause the most sea. With a dead southerly wind there is comparatively little sea; and with a south-easterly wind, though blowing hard, there is still less.

The breakwater would likewise, from its length, give a more easy and safe approach, as well as more time to recover steerage and to avoid the danger of the narrow entrance with a heavy sea right into the mouth of the harbour, and, as is frequently the case, a bar to contend with at the same time. It would likewise allow vessels, going to sea, to take the swell gradually, instead of their being as now thrown on their beam ends, in a surf at the most critical moment, namely, on opening the south head; for a vessel, leaving Dover harbour in a strong wind, is obliged to set more sail than she can carry when outside, in order to force her through the sea, because she loses way when abreast of the Customs watch-house, in consequence of the buildings throwing the wind out of her sails. These difficulties would be obviated by the breakwater as her canvass could then be arranged according to the strength of the wind which she could carry gradually into the sea-way. There is an instance on record,

of a brig heeling so much from the before-named causes, that she shifted her ballast and was obliged to bring up in the bay, in order to be righted, where she slipped her cable, and ran for the Downs.

Here I must not omit to mention what is now the practice with our great hovelling boats, (the finest perhaps in the world,) when it blows too hard for the government packets to put to sea, with the mail, or when they are prevented by the bar, from getting out: and when these boats are engaged as substitutes, under such circumstances, the hovellers invariably make sail from the inner part of the harbour, in order to give themselves as much way as possible through the breakers, and to clear the heads. It is likewise their practice, at such times, immediately on clearing the north head, to run into the bay under the lee of the bar, which shelters them from the breaking seas, taking only the flower of the breakers, when they gradually haul their wind and steer their course across channel.

Another advantage that would accrue from the formation of the extreme end of the breakwater, I propose, would be, that it would be next to impossible for a sea to warp or wrap round it; for in whatever direction it might be struck, the sea would be spilt, whereas, the present formation of the south head, serves as a conductor to the waves directly into the mouth of the harbour. The battering sides of the breakwater, are also adapted to break the seas; for instead of their reflecting, they would have room to expand, and, falling through the open work, the feather only of each wave would be seen.

In connexion with this part of my subject, I may be allowed to enquire why are breakwaters established at other places? Why were the Glatton and Elder, (two men of war,) sunk in Harwich harbour? Why do ships get under the lee of Islands, Promontories, and Head Lands? Why are ships boarded on the lee side? Why do boats lie under the lee of Yarmouth and other jetties? And why do the pilot cutters when cruising off Dungeness, run into the East Bay, to ship their pilots? Unquestionably our pilots do so to seek shelter from the sea, and to get into smooth water. This reason is so obvious, that I think it must be evident to every one that a breakwater

would afford similar protection to Dover harbour, notwithstanding the opinion that was given in evidence by one witness before the Committee of the House of Commons, "that he should be frightened out of his life at the thought of a breakwater."

One other fact worthy of record, as tending to confirm my opinion of the utility of a breakwater is, that our boatmen, when they observe a vessel to the westward with a jack flying as a signal for a pilot to bring her into harbour, when it blows hard from the southward and westward, frequently lay in their boats under the lee of Cheeseman's head, and, waving the vessel close in, remain until she is nearly opposite the head, when they row off, put a man on board to pilot her into the harbour, and immediately return under the shelter of the head.

I recollect the case of an old schoolfellow of mine, who commanded aGovernment cruizer, and who on pulling out from the lee of Yarmouth jetty in a four-oared boat, was immediately upset on clearing the point; which circumstance proves that all projections do afford shelter. The shelter which the breakwater would afford the mouth of the harbour, would likewise be felt in its interior; for I have invariably observed whenever a spit or bank of beach has been formed in the direction I propose to place my breakwater, when it was blowing hard, that the swell has been considerably diminished. So much so indeed has this been the case, that vessels could lie as quiet in the harbour as they would have done in the basin, until the water has flowed sufficiently to beat over the bar. At such times, the seas rolling in, occasion a rebound from the perpendicular stone walls which surround the harbour on all sides, and produces the great swell in the outer harbour.

Having observed such great benefit arising from these occasional natural projections, I am led to believe that my permanent breakwater would effect much greater ones, particularly as, from its construction, it would be impossible, I conceive, for the seas to roll round it; but supposing for the sake of argument that they could, the distance would be so great from the mouth of the harbour, as to render them of no importance. Another most important advantage resulting from a breakwater would be, that, by diminishing the swell

in the harbour, this would enable the gates to be shut at high water; whereas, at present, frequently when it blows hard from the S. W. (the wind which produces most bar,) the swell is so great that it is found impossible to shut the gates until the water has ebbed as much as 6 or 7 feet, whereby a great quantity of back-water is lost, and the spring, for all sluicing purposes, is reduced to an ordinary neap-tide, at a time too when the quantity lost would be of the utmost importance.

I should propose likewise, should the breakwater be carried out, that the channel be deepened 2 or 3 feet; which might be done by the mere application of the pick-axe. This would be of immense importance when it is considered that, in the passage between Dover and the continent, every inch of water gained in depth, would be so much time saved; and it would enable the packets also to carry the weather tide longer in the offing, a circumstance of much importance in southerly winds. I am inclined to think, that with a little attention to this part of the improvement, our packets, whose greatest draught of water is 7 feet, would be able to lie afloat under the breakwater at low water in neap-tides, and at these tides the water does not ebb away from the pier-heads by about half that depth; so that, by deepening the channel 2 or 3 feet, together with the fall of the shore, which is about 2 feet more, this important advantage would be secured.

From soundings taken on the 13th day of March last, two days after the full moon, at low water, the basin gateway open, or in a direct line with the harbour's mouth,* the result of five casts of the lead, taken from the shore in quick succession, was as follows:—

1st cast, (the eastern point of the Foreland just open with the western land,) 1 fathom.

2nd cast, 2 fathoms.

3rd cast, 4 fathoms.

4th cast, (the eastern South Foreland light just open,) 7 fathoms.

5th cast, 10 fathoms.

Thus proving that the shore falls suddenly into deep water, which is also in favour of my proposed improvements.

* See Map No. 2.

And I have observed that in laying the stone apron before the south head, they have to dig down at least six feet to reach the rock to lay the concrete for a foundation. If this depth were gained in the channel it would be of immense importance.

In regard to the effect the breakwater would have upon the East Bay, I am led to believe that there it would likewise be of great advantage, for, on observing the two heads in a parallel line from the carriage road opposite No. 11, Marine Parade, it seems evident that the bay would be more protected by the extension of the breakwater; and I am satisfied that such would be the opinion of 19 out of every 20 persons viewing it from that direction. Indeed, were this not the case, it would be difficult to account for the smooth water which is observable in that part of the bay usually denominated the York house bight, at which place boats frequently land and launch, when it would be imprudent to attempt to do so at any other part of the bay, in consequence of the beach forming a natural breakwater at the back of the north head. I have heard it objected that the breakwater would offer impediments to vessels getting to sea in scant winds; but, as I have stated before, the breakwater would do no such thing, for its direction will be two points clear of the fair way channel of the harbour: besides, it would afford additional facilities which are not in existence at present. I propose that a warping rope shall be attached to the end of the breakwater, so that a vessel going to sea with a scant wind, either easterly or southerly shall have the assistance of it. With a southerly wind, vessels at present are obliged to make sail from the south head, and go to sea upon the starboard tack, clearing the north head with difficulty; but, with the assistance of a warp from the end of the breakwater, they would be enabled to do so with perfect ease. For instance, by making the warp fast to the vessel's quarter, and stopping it at the bow, she would be tracked along as far as necessary; when, by letting go the stop at the bow, she would be sprung to sea upon the starboard tack, clear of every thing, and a vessel bound eastward would always be able to go to sea from the harbour whenever she could lay round the South Foreland, which is not the case now. With an easterly wind, a vessel would be

tracked to the end of the breakwater, and go to sea upon the larboard tack. The warp being made fast to her, broad on the bow, and having the assistance of the bay eddy, the instant she felt the flood stream, her sails being filled, she would be wafted to sea in the winds eye. I have heard it objected also to my plan for a breakwater, that the tide would set so sharp past the end of it to the eastward, that vessels coming for the harbour would be swept away with the current, that they would not be able to fetch the harbour. To this I would reply, that my object is to obtain the tide for the purpose of carrying the shingle past the mouth of the harbour, and clear of the influence of the bay tide; (which it must be remembered runs 7 hours out of 12 to the westward, in the very track the shingles now progress;) and I have little doubt but that a vessel in a sailing breeze would cross the edge of the tide in about 30 seconds at most, and the instant she crossed it she would meet the eddy under her lee, which would bring her into the harbour in perfect safety: whereas vessels now run the risk, between the two tides of either missing the harbour, or running on the south pier head, even with the most skilful pilot on board. Two instances of this occurred but a short time since, when the Charon and Widgeon, packets, did themselves some little damage by running against the south head, and not answering their helms, in consequence of the great influence of the bay eddy.

Such an occurrence could never take place with my breakwater; for it would be next to impossible to run against the end of it, even by trying to do so, and steering directly for it with every sail set; and as to missing the harbour, the length of the breakwater would effectually prevent this; for more time would be given to bring the vessel to a steady course, and enable an ordinary pilot to shoot the head without any risk or difficulty. Indeed, I cannot imagine that the rate of the tide past the end of the breakwater, would be much increased. Cheeseman's head has a similar effect at present, and it is only intended to extend the breakwater well on to the edge of the true tide, carrying the bay eddy away with it, and thereby turning it to advantage; and I should think no serious objection could be urged against the breakwater on that account: for it seems to me that it would have but little influence over

the rate of the tide, although it would serve as an index to shew its rapidity.

I know it is the opinion of some of the engineers, who have reported or given evidence on Dover harbour, and who are opposed to any extension of the south head, that the shingles would follow such extension, and in consequence, endanger the Bay by stopping the beach; but my plan would only stop the beach for a short time. This part of my plan I only desire to be fairly, impartially, and disinterestedly judged of; and I flatter myself it will be readily seen, that by concentrating the force of the culverts, and bringing the whole 21 acres of backwater to act upon the apron, on the west side of the breakwater, at short intervals, would prevent that accumulation, whilst at the same time the bay would receive its usual supply.

In the month of February last we had tides which did not flow more than about 9 feet, and which could not give more than an average of 5 feet back water, available for the purpose of sluicing. Now supposing at such times that we have strong south west gales, which choke the harbour's mouth, how will it be possible to keep it clear of bar? The culverts, without sufficient back-water, would be of little or no use. Of this Mr. Cubitt appeared fully sensible, when he replied to the questions, put to him by a member of the Committee of the House of Commons, on this subject. *

I still, therefore, adhere to the opinion I expressed to his Grace the Duke of Wellington, when I was sent for, to attend the Harbour Board, in 1836.—"That, although I gave them credit for what was doing, yet that the works in progress would not always answer the expectations of the projectors, as there would be periods when the sluices would be almost useless, and supposing them to be all-sufficient, the other great evil would be unprovided against—that of preventing the sea rolling into the mouth of the harbour, and which the present works do not contemplate."

I know it is likewise supposed by some that by extending the south head into the sea, or by carrying out a breakwater, the property in the bay would be endangered; but I apprehend no such thing; and I think I shall be able to shew that no

* See Evidence, page 74 and 75.—Questions, 2038 and 2039.

danger need be feared on that account. I believe it is generally understood, that the erection of Cheeseman's head, was partly the occasion of losing some portion of the land in the bay, as it stopped the supply of shingle, and that 50 feet of the head was taken down in consequence, with the obvious intention of securing that part of the bay opposite the York Hotel, where the sea was making rapid inroads; but by my plan, *the idea of which is entirely novel*, the shingle would only be arrested in its progress during neap-tides, the difficult period to prevent its accumulating to form a bar before the harbour, and then allowed to take its natural course for the supply of the bay as at present, during spring tides, with the assistance of a concentrated sluicing power.* Besides this, my plan contemplates the erection of a sea-wall in that part next the pier, which would be most exposed. In fact, I can see no difficulty in securing the bay under any plan or circumstance; for supposing the sea-wall should be objected to, from its expense, I think it is evident from the experience of the last year or two, that a much greater quantity of land might be secured in the bay, by means of the Castle jetty, than at present; and I even think that houses might be erected, in time, in front of the present ones—in short, to the filling up of the bay altogether.

For it must be remembered that the present site of the Marine Parade, Waterloo Crescent, &c. is all land gained from the sea, (as it is recorded in the early histories of Dover, that at one period the sea boundary in the bay, was the base of the cliffs and the town wall,) in consequence of the construction of the pier heads, an extension of which I have no doubt would have the same effect. For the purpose of securing the bay, the castle jetty was erected; and for the same purpose it was extended about 50 feet, in the year 1833, and the effect that its last extension had upon the bay must be remembered by all acquainted with it. But it may perhaps be more fully understood by a reference to the sketch on map No. 1, where I have shewn a design for an extension, with a tongue on the west side, to lock in the shingle, and another on the east side which would answer a double purpose, as a buttress to give strength, and also to catch the curl of the sea.

* See Map No. 2, Ref. N.

This curl is the active agent in washing away the land on the east side. Its effects may be aptly compared to an auger boring in a piece of wood. Any contrivance, therefore, that can be given to a projection of that kind, to "spill the sea" at its point, and to give it a direction outward, would prevent this washing away on the east side. The design given is my idea of how the projection of an extension of this kind ought to be constructed in order to obtain full advantages on the west side, and also to prevent the evils on the east.

I see no reason to doubt why a further extension of this jetty, if found requisite, should not have a similar effect, and be all that is necessary for the securing of the bay against the inroads of the sea, by retaining a sufficient quantity of beach for that purpose. For securing the valuable and extensive buildings, a sea wall could always be resorted to; as at many other places, if found to be absolutely necessary.

There are various opinions entertained respecting the progression of the shingle along the shore; but there can be no doubt that it travels from west to east, though at what rate it is not easy to determine. I shall leave this subject there fore,almost untouched, to the more speculative; though to assist them, I may mention a circumstance which occurred to a gentleman, who is still living, and who can vouch for its accuracy. He told me that whilst bathing from Gardner's, (now Duttson's) machines, in the summer of 1802, he lost a mourning ring, and that the same ring was picked up by a girl, in the winter of 1821, nearly opposite to No. 20, Marine Parade; so that it appeared that in 19 years the ring had travelled only about 260 yards:* by which circumstances it would seem that it is only the superficial shingles which do not locate, and that the substratum or sandy bed of the shore remains almost entirely stationary. The ring, which I have examined, appears in a tolerable perfect state, and does not seem to have suffered much from friction. There are a few indentures upon it from pressure, but it appears to have been very little injured. I should certainly myself argue from this circumstance, that it is only the surface which requires some security for the preserva-

* To remove any doubt of its being the indentical ring, it may be mentioned that the party assures me that only one of the description was made, and that it had the inscription of "James Hanker, died Nov. 1, 1801, aged 46 years."

tion of the bay, and the valuable property which skirts it. I might also instance Deal as a proof, that land can be secured by means of a sea wall as well as Folkestone, where the bay was originally similar to our own. Some acres of valuable land have been gained to the westward of the latter place since the erection of the pier, and in a short space of time; so that, I think, no fears need be entertained as to the fate of the bay, or any doubt as to the proper means to be used to secure it.

It may be said perhaps by some, that the harbour this winter, has been more free from bar than it has been for some years; and some may no doubt attribute this to the effect the sluicing power has upon it, and contend, from this circumstance, that the works are all sufficient for the purposes required; but I would beg it to be borne in mind, that this winter has been a very favorable one, and that we have had a great prevalence of easterly winds. Although it *was* stated by one of the witnesses examined before the Committee of the House of Commons, that the new sluicing power, when completed, would be able to *force the beach from off the apron like chaff before the wind;* yet it may be questioned whether they could possibly have possessed such power, considering the great weight of the shingle: a fact, I believe, few have taken the trouble to ascertain. Indeed the engineer of the harbour himself acknowledged that I gave him a valuable hint, when I informed him that I had ascertained that the weight of a cubic foot of shingles averaged about 104 lbs. It therefore will be seen, it requires no ordinary power to remove such a ponderous mass, consisting as it does of many thousand tons of materials, so quickly collected at the harbour's mouth; and partaking of properties something like a fluid, inasmuch as it has a tendency to run together, and, by a species of attraction, to unite and fill every vacuum that occurs within its range.

I do not wish to detract from the merit of the present works; but I would wish to place the ostensible objections to them, before the public, in order that they may judge of the advantages, which might be gained by the execution of the improvements I propose. Among others I may be allowed to mention the facilities which would be afforded for shipping pilots, &c. which would prove of great advantage to the nautical

interest; because ships would then be sure to be supplied with pilots at Dover, in the event of their missing the cruizing cutters off Dungeness, a circumstance which sometimes happens: whilst they are not able to get off from Dover, in consequence of the heavy sea upon the shore. These facilities of shipping pilots would operate to the certain benefit of the boatmen belonging to the port; for there can be no doubt but that their boats could many times, at low water, lie afloat under the lee of the breakwater, and be handy for any purpose: whereas now they are often prevented from getting out at such times, and lose part of their employment, in consequence.

One great objection I have to the stone apron is, that it has established a danger in the mouth of the harbour. I can compare it to nothing better than a sunken rock, with a smooth surface, and we are not without instances of accidents having occured by it.

Before the stone apron was laid down, it was not unfrequently the case that vessels could get into the harbour by working through the shingle: for though there was something less water over the bar than they drew, the beach would yield to their pressure, and they gradually worked through it, in moderate weather, without much risk. It often happens too upon a shift of wind, after it has blown hard from the southward and suddenly changed to the westward, that there remains before the harbour a great deal of the old sea, as it is termed; and whenever this is the case, vessels are obliged to haul close round the south head, (if the wind is short,) to get into the harbour. Now, supposing a vessel with a cargo, to fall a few times in the hollow of the seas, three or four feet upon this apron, what must be the consequence? She must inevitably do herself considerable injury, and the greatest care must be taken in future not to attempt the harbour under such circumstances.

It has been said that the new works would always keep open a south westerly channel, and I believe the construction of them took place ostensibly with this object in view; but they do not appear to have realized this expectation, for we have had as often a north easterly, as a south westerly channel. But admitting that the works had answered the purpose

for which they were originally designed, how is it possible that this channel could have been made use of by a sailing vessel with a north-easterly wind, any more than a north-easterly channel could be made use of with a south-westerly wind? It is this which occasions some of the difficulties in entering Dover harbour, and consequently it would be folly to establish a particular channel, unless we had the power likewise to establish a particular wind to sail into it. It is generally acknowledged, that Dover harbour is only serviceable as a harbour of refuge with north-easterly gales; and I would ask any one, however little acquainted with nautical matters, how a narrow south-westerly channel could be sailed with a north-easterly wind, when it is well known, that under such circumstances, a vessel must haul close round the north pier head to gain the harbour; and supposing for one instant her not being able to fetch in and fall upon the south head, what must be the consequence of striking upon the stone apron now lying down? Another inconvenience, to say the least of it, attending the harbour in its present state, is that when our hovelling boats happen to be caught at sea in a gale of wind, they have no shelter to run to at low water; and when there is a bar before the harbour, and the dreadful sea breaking in, it renders it so dangerous an entrance that they dare not venture to approach. They choose therefore the only alternative left them, namely, that of running their boats ashore upon the bar at low water, and suffering them to be beaten over it with the waves of the flowing tide, the risk in so doing being less than would be incurred by attempting the harbour with a bar, and sea running right across it: for it has been invariably observed, that whenever an accident has happened, it has been immediately in the mouth of the harbour, or between the end of the present north head, and the site which would be occupied by the extreme end of the proposed breakwater, many instances of which are fresh in my recollection.

There is another observation I must here make:—it is this, that if it is really the intention of the harbour authorities, to secure the shore between the south head and Cheeseman's head, either by stone-work, or piling, (and there seems an imperative necessity that it should be done, unless the plans

I propose are adopted,) I would take the liberty of cautioning them to pause, lest they create another danger in this situation; for it has been no uncommon occurrence for vessels to ground behind the south head, and one or two cases have occurred there, where they have been wrecked. Such things may occur again, and I cannot see how the risk can be diminished, by having a stone wall or pile work in this situation, or how it can be lessened by the extension of Cheeseman's head. Vessels now sometimes find it difficult to clear the end of this projection, and this difficulty would be increased by its extension.

One other important advantage, not to be overlooked, of my plan would be the establishment of more efficient harbour lights, which I would have placed in such situations as would constitute them sure guides for the harbour, instead of the present ones, which are very indifferently placed for this important purpose. I should, for instance, recommend that a light be placed on the north head; and the utility of such a light is apparent from the constant use that is now made of a common lantern, which is hung over the side of this head, to indicate its situation when vessels are coming for the harbour. This light would also establish a thwart mark for turning to windward in-shore from the eastward, and for the want of a light many of the harbour pilots, to use their own words, look for the north head with "tears in their eyes." It ought always to be the plan in establishing lights, to make them not only marks to indicate the object intended to be pointed out, but also to place them in such positions as will make them leading marks; this ought most particularly to be attended to in harbour lights, but in ours they are of no service whatever in directing vessels into the harbour. I have therefore arranged those I propose in my model, to the satisfaction of all who have seen it, in such a way as will make them the best leading marks possible for vessels coming into the harbour, as well as shewing its situation.

The more I think on the subject of the lights, the more I am surprised and astonished that so little pains have hitherto been taken, in order to render them more useful for this purpose; and, considering the great outlay which has been made, that such an object should have been so long neglected,

particularly when I observe the money that has been spent about the harbour upon mere baubles in point of utility, as compared with the establishing of proper harbour lights.

Among other things may be mentioned the great necessity there is for proper places for the landing and embarking of passengers, and considering that Dover is the principal port on the coast for such traffic, every accommodation ought to be afforded for this purpose. The present plan of a ladder is very inconvenient, and at times particularly disagreeable, especially to ladies, many of whom have been known to return whence they came, rather than venture on board a boat by such means. There is also sometimes such a swell, (rising and falling of the water,) that it is difficult to keep the ladder in a proper position; the effect of which was observed by Mr. Cubitt, and described in his evidence.* The removing of this objection could be so easily accomplished, that it could not be attended with any great expense, as on the east side of the harbour there is plenty of space for the purpose, although on the west side the large tunnel might prevent it. I propose that two flights of steps be made, so that a gang board, with hand-rails, might always be placed horizontally on board the vessel. The entrances to such stairs might be secured by means of a parapet wall and gates, as is shewn on plan, No. 4. The gates might be conveniently used, one for passengers, and the other for baggage, so as always to afford comfortable and convenient accommodation for embarking and disembarking ladies, particularly after a sea voyage, when every attention is requisite.

Another very useful thing, which might be occasionally of great service in thick foggy weather, would be a gun on the pier head, to be fired at stated intervals, which would serve to guide vessels into Dover harbour at tide time, during those periods when we are subject to very dense fogs. At such times it is hardly possible to hit the harbour, more particularly in thwarting a strong tide across the channel. Vessels, in such circumstances, are at a loss to know whether they are to the eastward or westward of the harbour; and require a signal to indicate their position. My reasons for recommending a gun in preference to a bell, are these:—The signal

* See Evidence, page 77, Ques. 2073.

would be heard at a much greater distance, as the bearings of sound can be set with almost as great accuracy as though the object were seen; and when a vessel is in the south west of Dover, with a south west wind, a bell could not be heard, when a gun would. The signal would also be more clearly defined by firing at stated intervals. A gun could be worked with much less labour if mounted on a non-recoiling carriage, than a bell, and I believe it could be established with as little expense. It may be advanced that a gun would be a running expense for powder. This I am sure would be of little moment when it is considered that upon an average it would not be required to be used more than about half a dozen times or so in a year; and then only, say from half-flood to half-ebb. Other harbours are provided with similar assistance, one of which I may instance, Holy Head, where the public service is much benefited by the packets having no difficulty to find their way in, in thick weather.

Among the many objections which may be started to the proposed breakwater, I shall mention one here, which it may be necessary to explain in order to remove it; for though I am satisfied that, to the experienced seamen, this may not be necessary; yet deep-rooted prejudices are so strong in the minds of many, that they are oftentimes difficult to remove. Reasoning may sometimes convince, and facts may startle, but prejudice is stubborn, and, I fear, I may have some little of that to contend with in the present case. It may be advanced, for instance, that the breakwater extending 250 feet into the sea, will be in the way of vessels passing up and down channel; but I would reply to this, that no coasting vessel passing Dover, nor in fact any vessel, ought to shut in the South Foreland lights, and that such are the instructions laid down for them. Besides, were vessels to come so close in-shore as to strike on the breakwater, there are other dangers to be apprehended, of even more fearful consequences than my breakwater; and in order to prevent a possibility of vessels running against it, the harbour lights would be placed in such positions as would, I apprehend, always guide them in avoiding it.

I propose likewise, that the large portion of waste beachy ground lying between the north head and the York hotel,

should be thrown into the harbour, by the erection of a sea-wall.* This would materially enlarge the harbour, and be a convenient place for vessels to run into on entering it, clear of obstruction: one side of it to be left with a shelving bank of beach,† as was formerly the case on the opposite side of the harbour, and to be furnished with mooring buoys, by which means vessels could be hauled to any part of the harbour at pleasure. The wall could be so constructed as in the event of a war, it would form a battery for the protection of the entrance of the harbour, as well as the whole line of property in the bay. At the same time the arches might be made very serviceable as coal stores, &c.; and vessels could come into the harbour and get supplied, without going through bridge; and proceed to sea again the same tide. The wall I propose would require to be extended about 750 feet towards the York hotel, and this would give about 50 arched store-rooms. The battery to be 25 feet wide, and the quay 15 feet. The store-rooms should be 12 feet wide. The springing walls 6 feet high, and the arches to spring two feet; the springing walls to be 4 bricks thick, with the exception of every sixth alternate wall, to be eight bricks thick. Steps to communicate with the platform; and towers to be erected for guard-rooms and sentinels' stations.‡

* See Map No. 2, Ref. L.

† See Map No. 2, Ref. G.

‡ See Sections and Elevations.—Sea-wall.

ON THE ADVANTAGES

THAT WOULD BE DERIVED FROM MY

PLAN OF SLUICING.

It must be borne in mind that there are two denominations of tides—spring, or high tides—and neap, or low tides: spring tides occur at the full and change of the moon, and neap-tides at the intermediate quarterings. There are, therefore, alternately seven days' spring, and seven days' neap, completing the revolution of the moon in 28 days, and giving two ebb tides and two flood tides in the 24 hours. The bar of shingle collects most during the neap-tides, which is the very worst period it could collect; for, during these tides, there is a much less flow of water, and consequently, much less back water to bear upon the bar. The reason perhaps of its collecting most at this period, is, because the bar or shingle is for a less period still, in consequence of the water not flowing so high or ebbing so low as during the spring tides, and this causes a constant lashing of the sea against the beach and pier heads.

My plan therefore is to retain the shingle by means of the breakwater during the neap-tides, and to drive it away by means of the sluices during the spring tides; for it must be obvious to the meanest understanding, that by so doing I would keep a clear harbour during the worst period, when the backwater is insufficient, and get rid of it at the best period when there is plenty of water to force it away. This would effect the two-fold purpose of keeping the bay supplied

with beach, and at the same time preventing its being any annoyance to the entrance of the harbour. The particular method of sluicing must of course be determined by the nature of the channel, &c., at any given time, either by sluicing through the tunnels or culverts at the back of the breakwater alternately, with the turnwater at the mouth of the harbour, or both together, if required, so as to form a junction at the end of the breakwater. I must beg, however, to point particular attention to the great advantage there would be in having an opportunity to check the beach in its progress along shore, across the mouth of the harbour, during the worst tides, and the facility this would afford for getting rid of it by degrees, and supplying the bay during the time that a large head of water could be brought to act upon it with advantage, in a concentrated form. In the mean time, I request that it be borne in mind that my plan would in no wise diminish the effect of sluicing by means of the turnwater at the mouth of the harbour, as at present; for I conceive it would be increased by the breakwater acting, as I have said before, as a conductor to it. The force of the water through the culverts at the back of the breakwater, would thus be increased *ten-fold, by concentrating its effect upon the breakwater apron!* the outer edge of which being higher than the inner, and forming the base of a tunnel or arch, one culvert, upon my principle, would be equal to the whole five at present, as there would be no diminution of the momentum by friction, the weight of the water alone resting upon the apron.

SUMMARY OF THE RESULTS

THAT WOULD MOST LIKELY FOLLOW THE

EXTENSION OF THE SOUTH HEAD,

AS COMPARED WITH THE

EXTENSION OF CHEESEMAN'S HEAD.

BREAKWATER.	CHEESEMAN'S HEAD.
The breakwater would give immediate shelter to the harbour's mouth, by its *proximity*, as the end of it woud bear about south from the north head.	Cheeseman's head, though extended, would give no shelter to the harbour's mouth, unless extended to a very great distance, as, on account of its being so far westward of the harbour, it would require to be carried out, at least, some thousands of feet, to bring it in the same line of bearing as the end of the north head.
The breakwater would make an offset of the bay eddy, and unite with the true tide at the end of the breakwater to the eastward of the harbour's mouth.	Cheeseman's head being extended would make no alteration in the bay eddy, which would continue to run across the harbour's mouth home to that head as at present.

BREAKWATER.	CHEESEMAN'S HEAD.
The breakwater would cause less swell in the harbour.	The extension of Cheeseman's head would not.
The breakwater would afford shelter to vessels working to windward in the bay to gain the harbour.	The extension of Cheeseman's head would not.
The breakwater would secure the shore between it and Cheeseman's head.	Cheeseman's head being extended would place it in greater danger.
The breakwater would make a good launching and beaching place for boats on its west side, during easterly winds.	Were Cheeseman's head extended, that portion of the bay would be lost for these purposes.
The breakwater would keep a clear harbour, during neap tides.	The extension of Cheeseman's head would not.
The breakwater would give facilities for warping to sea in scant winds, on either tack.	Cheeseman's head being extended would not; but, with easterly winds, the difficulties would be increased, as it is even now under some circumstances difficult to clear that projection.
The breakwater would reduce the distance the shingle has to travel past the parallel of the north head, to about 180 feet, whilst it would be assisted in its progress by a sluicing power, far superior to any that the harbour possesses at present; in addition to which,	By the extension of Cheeseman's head, the shingle would have to travel about 750 feet with the bay eddy, to oppose its progress before it could cross the parallel of the north head, whilst it would have no scouring power to assist it.

BREAKWATER.	CHEESEMAN'S HEAD.
it would have the help of the bay eddy.	
The breakwater would give great facilities for deepening the channel, so as to admit the ingress and egress of vessels of easy draughts of water at low water in neap-tides, and, generally, at tide time, for vessels of larger draughts.	The extension of Cheeseman's head would not.
The breakwater would afford more frequent opportunities for the shipping of pilots from the shore, and with greater safety than at present, as it would afford protection under the lee of it.	The extension of Cheeseman's head would offer none of these advantages, but would leave the harbour with the same dangerous and contracted entrance as at present.
The breakwater would enable the hovelling boats to take the harbour with much less risk when caught at sea in gales of wind.	
It would increase the width of the harbour's mouth to 310 feet.	
It would afford shelter for the harbour pilots in their boats, under its lee, with south-westerly winds, when it is blowing too hard to row outside.	
It would give a progressive approach into the sea-way on going to sea.	

BREAKWATER.	CHEESEMAN'S HEAD.
It would give time for a vessel to recover her steerage.	
It would act as a turnwater in sluicing from the harbour's mouth by confining and diverting the water in a straight course to sea.	

The breakwater would not endanger the bay more than the extension of Cheeseman's head: in fact, there are no disadvantages attending the breakwater which would not apply also to the extension of Cheeseman's head; nor any advantages attending the extension of Cheeseman's head, which would not apply also to the breakwater.

Note. In order to enter fully into the merits of the above comparisons, a frequent reference to the maps Nos. 1 and 2 will be necessary; or, an inspection of the model itself would better explain them.

CONCLUDING OBSERVATIONS.

Having stated, in my address, the motives which have influenced me in publishing these observations, having given extracts from various authors shewing the importance of Dover harbour from the earliest period, and having explained my views in regard to the existing works, the objections thereto, and the benefits which would result from the adoption of my plans for the further improvement of the harbour, it only remains for me now to endeavour to impress the consideration of the subject forcibly and strongly on the minds of those in authority that the advantages of our local situation may not be thrown away; and to shew the absolute necessity of making this a safe and convenient port; that the importance of Dover harbour may receive the attention it deserves, in order that its importance may once more be considered, with regard to the probable effect it must have on the prosperity of this nation, in the event of a war (particularly with France) at any future time. To the Government this must surely be an object of the greatest solicitude; for who can contemplate the possibility of a war, without looking forward to the great and inevitable change which must necessarily take place in our mode of warfare, owing to the advancement of science which has taken place within the last twenty years. The employment of steam-vessels will introduce an entirely new system of hostilities, and few of our naval officers will be acquainted with their management, whilst many of them will be altogether ignorant of the principles and the power of steam. All will have to be learnt, and perhaps too on a sudden emergency, when, instead of being able to meet the enemy,

we may be found miserably defective in every description of protection for our coast, and defective in our harbours, either for the purpose of security, annoyance, or defence.

It cannot I think be denied, that the situation of Dover harbour renders it of the utmost importance. In time of war, it would be like the outpost of an army, and therefore would require the greatest vigilance and protection; because, as it is at a distance of only about two hours' run from the opposite coast, it would be constantly exposed to sudden attacks. It certainly, therefore, behoves the Government to give this subject a favorable consideration, in order that we may be prepared for any emergency; for in the event of a war with France, what would there be to prevent (with our present means of defence) the enemy's armed steamers from coming close into our bay, and firing a few shots into the houses on the Marine Parade or other parts of the town? Indeed, this would be particularly inviting to them, the whole line of buildings being so much exposed. This might happen too at a time when our cruisers were blown off the coast, when they were shut up in our harbour with an impassable bar before it; or perhaps when their steam was not up; for it must be remembered, that a few minutes' start with a steam vessel would be sufficient to place them beyond all pursuit, unless pursued by a vessel of much greater speed. It is said by sailors, that 'a stern chase is a long one,' but in these seas there is very little chance of this; and let an enemy but once send a few shots into our town, the whole of the newly-built houses might then be "paid off" and laid up in ordinary till peace returned.

But to return to improvement—What better opportunity could be offered for making such preparation than the present; now that we are at peace, and have leisure to turn our attention to an adequate means of defence; and by improving the harbour, it might be rendered at all times fit for the reception of steam-vessels, and some of her Majesty's ships. I may be considered by some to be an alarmist, but I cannot look forward to the probability of a war with France, without entertaining fearful apprehensions of the inefficiency of Dover harbour, and of the little service it would be in such circumstances, as compared with what a little proper management

might make it. In time of peace likewise it behoves the Government to look to the state of the harbours on our coast, and more particularly to this, from its being the most eligible port for the shipping of the mails and other intelligence to the continent. It behoves them also to look to the due protection of the commerce of the country, and to provide harbours of refuge upon the most useful as well as the most exposed parts of our coast. These considerations press with great force on the attention of the Commissioners of Dover Harbour, inasmuch as they are the trustees for the public good, and therefore they ought not to neglect any means to secure such important advantages. I trust they will not allow any conflicting interests to interfere, as, in these times of improvement, nothing ought to be allowed to stand in the way of the public service; and every private feeling, through fear of loss of office or other change, ought to be made subservient to the public good, in order to keep pace with the advancement of the times; and it is to be hoped that they will not suffer themselves to be led away by the opinions of a few individuals, who may be interested, or who may feel a delicacy in countenancing any plans of improvement which may seem to them inimical to the views of the Chief Commissioner of the Harbour, though they themselves are under his authority.

For instance, the Cinque ports pilots of Dover who although, as a body, they are highly respectable, and though their occupation leads them no doubt to give some attention to the harbour works, and its improvements; yet their opinions ought not to be taken before others who have equal means of judging, particularly as it was admitted by two respectable witnesses who were brought forward and examined before the Committee of the House of Commons, that during their experience* they had rarely or ever had occasion to bring vessels into Dover Harbour.

I entertain, however, a much higher opinion of his Grace the Duke of Wellington, than to suppose that he would wish any one to refrain from giving an opinion in a straight-forward manner. I wish the merits of my plan to be fairly discussed; I desire only candid and honorable treatment. I am led

* See Evidence, page 82, ques. 449, 452; and pages 96, 98, ques. 516, 517, 540.

to make these remarks, from the circumstance of only nine out of the whole fellowship of pilots, having condescended to inspect the model and hear my explanations, notwithstanding that I sent a formal invitation to the whole of them, through the master.*

This subject I should not have mentioned, but for the importance which might be attached to it, were I to remain silent on it; and, entertaining as I do the highest respect for the fellowship of pilots as a body, I should have been glad to have had an opportunity of explaining to them my views, which I have no doubt would have satisfied a great many of the advantages which would result to the harbour by the adoption of my plan of improvement. I have the satisfaction however of stating, that the whole nine who came to inspect my model, gave me their testimonials in its favour.

I would refer also here to an observation made by the superintendent of the works, for the purpose of shewing the feeling evinced towards any one who ventures to set up an opinion in opposition to those entertained by the employers of the Harbour Board. It was this, "that he had never heard any one speak favorably of my plan." Now this observation will be fully answered by referring simply to the numerous testimonials which I have received in its favour, copies of which will be found under the head "Testimonials."

To the commercial interest of the country I need hardly appeal, feeling persuaded that it must be acknowledged by all

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* Dover, Nov. 4th, 1836.

Sir,—Having for some time devoted much of my time and attention towards the improvement of Dover Harbour, and having completed a Plan and Model in order to shew the extension of improvement which I suggest, and which might be added to the work at present carrying on, I beg leave respectfully to invite the attention of yourself and the Fellowship to which you belong, to this subject; and I shall be obliged by your communicating the same to the Pilots generally, in order that they may have an opportunity of expressing their opinions upon the merits of the plans which I propose, being persuaded that no class of men is more qualified to form a correct judgment on the subject, than the Pilots, from the nature of their intelligence, experience, and avocations. I shall be happy to attend to any individual of the Fellowship, to explain the nature and effect of the plans which I propose, and to receive any suggestions they may have to offer, feeling persuaded that Dover Harbour is capable of being made a safe and commodious port in all weather, and that it is the duty of every inhabitant to assist in forwarding a result which would prove beneficial to the town in general, and to the shipping interest in particular.

I am, Sir, your obedient Servant, &c.

BENJAMIN WORTHINGTON.

To Mr. S. Norwood, Master of the Pilots.

engaged therein, that the rendering of Dover harbour a safe and commodious port must be productive of the greatest benefit; for how often would it afford protection and shelter to vessels in distress or detained by contrary winds, provided they could get into it without risk or difficulty. Now, however oftentimes when they most require it, they dare not approach; and situated as it is, in the narrowest part of the channel, it is highly desirable, in a great commercial country like this, that a harbour of refuge should be established. The shipping interest is entitled to this consideration, because they are compelled to pay towards the support and maintenance of Dover harbour without receiving a corresponding advantage from it, although, I have no doubt, it might be made available for many even of the largest class of ships at all times. For supposing them to be divided into four classes, as for instance, ships trading to the East and West Indies, and the continent of America—

1st Class	drawing from	17 feet	to	22 feet.
2d Class	,,	15	,,	17	,,
3d Class	,,	12	,,	15	,,
All other Classes ..	,,	7	,,	12	,,

I cannot see why the whole of those classes should not be able to avail themselves, at times, of Dover harbour, particularly in cases of distress, provided a good channel could be depended on, (as it must be borne in mind, we have a flow of water varying from 10 to 22 feet,) as well as Foreign vessels during the winter months, when the ports of Holland, &c., are closed with ice. How often would foreign merchants direct their ships to put in here to winter, when they arrive too late in the season to reach their destination, or too early in the spring, before the rivers are navigable, Dover being so conveniently situated, that they might be able to avail themselves of the first breaking up of the frost to proceed home. This would of necessity add greatly to the trade and prosperity of the town. Instances of this have been experienced this winter, although, were the harbour rendered more serviceable, instead of about half a dozen sail we might hope to see from 50 to 100; whereby almost every tradesman in the town would reap some benefit, and the value of the property in the pier would be doubled in amount in the course of a very short time.

The improvement of Dover harbour will be rendered also absolutely necessary by the increased importance which will be given to it, on the completion of the railroad, between this place, London and Brighton; and it is highly desirable on that account, that this subject should not be neglected, particularly when we see that our neighbours on the opposite side are promoting likewise the formation of railroads, and one in particular between Paris and Brussels, with branches to Calais and Boulogne, which will connect the principal cities of France and Belgium with this country. Now bearing in mind the locality of Dover, how important is it if we wish to preserve our station, that we should keep pace with the rapid strides which other parts of the country are making towards completing those modern improvements. Indeed, the extensive alterations which this mode of conveyance will introduce, render it necessary that Dover harbour should be made available for the extended commerce which it is natural to expect will be the result of the gigantic speculations of modern times, which are now being carried to such an extent that no one can calculate what will be the effect of all those immense undertakings; although they will, no doubt, tend much to increase the facilities of communication, and multiply in a great degree the commerce carried on not only between towns which are now situate remote from each other, but between countries which have hitherto had but little intercourse in a commercial point of view.

The following remarks, extracted from the 'Shipping Gazette,' on the subject of harbours of refuge, are very appropriate:—

"The subject of harbours of refuge is one which ought to be pressed upon the attention of Government without delay. We justly boast that England is the first maritime nation in the world; but there seems some reason to apprehend that this very confidence in our superiority, may cause a relaxation of our watchfulness, and a carefulness of the means by which alone that superiority can be maintained. The rivalship of other nations, who are straining every nerve to increase their maritime strength, and diminish the ascendancy of Great Britain, ought not to be disregarded; but it may be justly doubted whether all that attention and vigilance are exercised,

which the importance of the matter demands. In one particular — for instance, in the improvement of harbours — the Government of France seems to afford an example well worthy of being imitated in this country—there every project for such a purpose is promptly entertained and fairly investigated, and, if it appear deserving of public support, care is taken that encouragement shall not be wanting to carry it into effect. In England, however, any measure for the improvement of a harbour, must have better luck than usual, in high quarters, not to be deemed something of a bore; nor is it probable that much attention will ever be paid to it, except through the interference of some party who could speak in its favor, "as one having authority." In that case, attention probably would be given to it, much more for the sake of obliging the influential applicant, than from any due appreciation of the importance of the application itself. Surely it is time that some different mode of procedure should be adopted and all grounds for such serious complaints be removed."

To the philanthropist it must be a source of great comfort and consolation, to aid in the good work of establishing the means of security by providing Ports of Refuge, on all parts of the coast; particularly when we consider the immense loss of life which annually takes place for the want of such accommodation at the most exposed parts; and who can contemplate without emotion, the possibility of accidents which occur so frequently to our brave seamen, without wishing to provide for them some port of refuge to which they could run without danger, and find shelter for a time from the pitiless storm. It is lamentable to think of the number of accidents which might be avoided, and the saving of life and property which might be gained by the providing of such harbours as would inspire confidence in their troubled minds, and repose to their fatigued bodies, after hours of broken rest and toil; and such no doubt would be the effect in making this, and every other harbour, fit to run to in cases of distress or difficulty.

"Britain has about 24,500 ships, employing about 250,000 men. The maritime class is important, if on no other ground than its numbers. What class can appeal more truly to their past sufferings than sailors?" "How affecting, how appalling the statement, that for every sixteen sailors who die of all dis-

eases, eleven die by drowning, or in wrecks. A select Committee of the House of Commons was appointed, in 1836, to inquire into the causes of the number of shipwrecks; so alarming was the increase. The report of the Committee was brought up in August in that year, and the following were its resolutions on the *Extent of Loss in Property and Lives at Sea:*"

Number of Vessels stranded or wrecked.

1816	343	1833	595
1817	362	1834	454
1818	409	1835	524
	1114		1573

Number of Vessels missing or lost.

1816	19	1833	56
1817	40	1834	43
1818	30	1835	30
	89		129

Number of Vessels in each year, of which the entire crews were drowned.

1816	15	1833	38
1817	19	1834	24
1818	15	1835	19
	49		81

Number of Persons drowned in each year, by ships named.

1816	945	1833	572
1817	499	1834	578
1818	256	1835	564
	1700		1714

Who is there but must shudder at this frightful picture. Surely then it behoves every one to aid in the good work of providing for our sailors as many places of refuge as possible upon our coast, and at this part above all others, where, from its situation, one is most required. Let us take another view of the situation of Dover harbour and, as we have shewn its

importance, let us see if it has not retrograded in the scale, as compared with other places. In the Naval Chronicle of 1799 it is stated, that in the year 1346, at the siege of Calais, Dover assisted King Edward the Third with twenty-one ships, averaging about twenty-five or thirty men each; but I doubt whether at the present moment a similar number could be found in the various avocations of coasting, fishing, or other employments belonging to the port. The town of Dover has increased of late years in size and importance; but this is to be ascribed to other causes than that of the state of its harbour. What, however, is there to prevent its being made one of the first ports in the channel, if all the aforesaid interests would but unite for its accomplishment.

No stronger argument I think can be required to prove the necessity of a harbour of refuge, on this line of coast, where ships could run fearlessly for, in a gale, than the answer given to a question, asked of the senior Pilot of the Cinque Ports Fellowship—one of forty years standing.*

I would ask therefore if he would neither run for Dover nor Ramsgate harbour, there being no other port accessible on this line of coast, where he would run to? or what he would decide upon; more particularly if under the circumstance of the loss of his anchors, from the vessel's bows? It appears to me there is a choice of decision only in this way, either to chance the North Sea, or run on shore in Pegwell Bay, better known by the name of the Sandwich Flats; and I have frequently heard it asserted by men of experience, and I am sure such would be the opinion in a majority of cases, that ships would come off with less damage by grounding in Pegwell Bay, than by risking Ramsgate Harbour in a heavy gale of wind.

Before I take leave of this subject, I beg to crave the indulgence of my readers, for any errors I may have made in the details of my plan: it is to the principle which I beg particularly to direct attention. The development of this plan is my first essay, and as time has not allowed me to be particular in regard to its minutiæ, to those whom any of my explanations may appear obscure, and who may feel a desire to be further informed, I hold myself ready to explain per-

* See Evidence, page 91, ques. 621.

sonally any point, where further information may be desired. I have now only to express a hope, that, in the observations I have made, and the arguments I have used, I have neither said nor related any thing to give offence to any one, such a course being adverse to my wish or inclination; I have only employed, I trust, allowable and proper means to obtain an end; and I can only say, that if any one shall take offence I disclaim all intention of giving them cause. To endeavour to please every body would be vain; to abstain from acts of usefulness from the fear of offending, would be weakness; my exertions are directed to a public good, and if I should be but remotely instrumental in promoting that good, without inflicting an injury, I shall be the more thankful, as it would add to the safety, happiness, and comfort of those whose perilous calling is on the deep.

TESTIMONIALS.

[*From Commanders of H. Majesty's Mail Packets To Lieut. B. Worthington, R. N.*]

Dover 24th Sept. 1836.

Sir,

We beg to thank you for the opportunity you have given us of inspecting your Model and Plan for the improvement of Dover Harbour; and we have no doubt on our minds, that, if the plan you suggest was carried into effect, it would entirely remove the evils so much complained of, and render it a desirable port to enter at all times, and in all kinds of weather.

We are, Sir,
Your obedient Servants, &c.

J. Hamilton,
Ethelbt. Lyne,
R. Sherlock,
L. Smithett,
} Commanders of H. Majesty's Post Office Packets.

To Lieut. Benjamin Worthington, R. N.

[*From Members of the Fellowship of Trinity Pilots to Lieut. Benjamin Worthington, R. N.*]

Dover, Sep. 1836.

Sir,

Having carefully examined your Model and Plan for the extension and further improvement of Dover Harbour, and be-

ing anxious with yourself to see carried into effect some improvement that would tend ultimately to render Dover Harbour, at all times, a safe and commodious port, (particularly as we feel the necessity of its being made so, in consequence of there not being any good harbour as a place of refuge for ships, between the Downs and Portsmouth,) we beg leave, as Members of the Fellowship of Pilots belonging to the Cinque Ports, and residents of this place, to offer our voluntary testimonial in favour of the plan you propose for the accomplishment of so desirable an object. And we have every confidence in certifying, that we consider the Breakwater projection at the South head, would, under all circumstances, remove the bar—keep the harbour's mouth free, and give a safe and easy approach in gales of wind—that the enlargement of the outer harbour would diminish the swell, and remedy the evils at present existing and so much complained of: and that your arrangements for the security and mooring of ships, and for giving them other assistance on entering in bad weather, are made with a judicious and seaman-like view, and well calculated to give great satisfaction to all owners and masters of vessels, entering Dover harbour through stress of weather. We confidently therefore recommend the whole of your plan for adoption, considering it would be a lasting benefit conferred on the shipping interest, on the town and port of Dover, and the country in general.

We are, Sir,

Your obedient Servants, &c.

Robert Hammond, *Warden*
Thomas Mackie, sen.
Henry Griggs
Hugh Sclater
Henry Pascall
James Wood
Samuel Norwood, *Master*
Thomas Mackie (2)
Henry Pilcher

To Lieut. Benjamin Worthington, R. N.

[*From the Harbour Pilots and Boatmen of Dover to Lieut. Benjamin Worthington, R. N.*]

Dover, Nov. 1836.

Sir,

We, the Harbour Pilots and Boatmen of this port, beg to thank you for the inspection of your Model, Plans, &c. for the extension and improvement of Dover Harbour. Being interested, as boatmen, we must feel more anxious than yourself that an improvement should be carried into effect: for it must occur to you, that we frequently experience the greatest difficulties from the uncertain position of the bar, rough sea, and cross currents; and we feel certain that you must have often witnessed our compulsion to run past Dover harbour from the uncertain state of the channel.

The Breakwater projection at the South Pier Head, and the enlargement of the harbour, we have minutely inspected; and we feel confident that such improvements would, without doubt, be the means of removing the bar, keeping the mouth of the harbour free, rendering it more easy of access, and also prevent the heavy swell in the outer harbour, which has of late caused so much damage to shipping; and we feel doubly confident that it would give a safe and easy approach in gales of wind.

Now, Sir, only reflect for one moment on the distress that must evidently take place amongst us in our livelihood. Supposing we are at sea on the look out, in rough weather, for the object of rendering assistance to shipping, and we fall in with vessels which would wish to enter the first port. We tender our offers, and the captains frequently refuse to engage us, saying, "Dover harbour is not safe to enter—we will sooner ride it out." Thus we lose all chances of gaining a subsistence. It is not only injurious to ourselves, but must necessarily be a great detriment to property afloat.

The most desirable object is to get vessels in, in bad weather; and from what we have seen of your model, we feel confident such an undertaking would remove the evils so much complained of, and ultimately confer not only a lasting benefit to ourselves, but to the shipping interest generally.

In getting vessels out of the harbour, of course it is more easy, as few attempt to go to sea in bad weather; and we much admire your method of warping vessels to the extremity of the breakwater. It would render an advantage to the port of which before it has been destitute.

We are, Sir, your obedient Servants,

Edward Richardson*	William Terry*
John Ellenden*	Thomas Holyman*
Joseph Ellenden	Charles Westo
Isaac Pattison*	Henry Frost*
John Hammond*	Walter Mackeen*
Michael Gillman*	William Jeken*
John Goodwright	John Terry, sen.*
Peter Simons*	William Adams, jun.
John Hammond, sen.	Joseph Hammond
Thomas Shepherd	Abraham Scymonds
Thomas Archer	James Boyles
John Gafford*	Henry Maclear*
Thomas Cook*	John Lewis
William Sharp	William Hoskins
William Parish*	William Francis*
John Dodd*	John Smith Norris
Hill Norris	George Archer*
Matthew Hammond*	John Young
John Saunders	George Dannels
Thomas Young	John Cole
John Beer	T. Scoones
William Lattimore*	John Sharp*
Jeremiah Hammond	John Goldsack
Thomas Welch	James Davey
William Critch	John Reader*

Those marked thus,* are licensed boatmen, whose knowledge in these matters, may be estimated from the following copy of their licence.

(COPY OF LICENSE.)

CINQUE PORTS.

By the most Noble ARTHUR, Duke of Wellington, Constable of Dovor Castle, Warden and Admiral of the Cinque Ports, Knight of the most Noble Order of the Garter, and Field Marshal of her Majesty's Forces, &c. &c. &c. and ROBERT HENRY JENKINSON, Esquire, Lieutenant Governor of Dovor Castle.

No.

It having been duly certified to me, by the Commissioners acting, at *Dovor*, under an Act of Parliament, made in the Fifty-third Year of the Reign of his late Majesty King George the Third, intituled "An Act to amend an Act passed in the last Session of Parliament, intituled, '*An Act for* "*the more effectual Regulation of Pilots, and of the Pilotage of* "*Ships and Vessels on the Coast of* England; and for the "Regulation of Boatmen employed in supplying Vessels with "Pilots, licensed under the said Act, so far as relates to the "Coast of *Kent*, within the limits of the *Cinque Ports*," That —— —— of *Dovor*, Boatman, has been examined by them, and approved as qualified as to his Knowledge of the Coast, and his Ability to conduct Ships and Vessels into the *Downs*, and the Harbours of *Dovor, Ramsgate, Margate, and Folkestone*; I do hereby grant him my License accordingly, to assist Ships in Distress, and to conduct them into and out of the said Harbours, and to put licensed Cinque Ports Pilots on board of Ships and Vessels coming from the *Westward*, and bound up the Rivers *Thames* and *Medway*, and I require him to reside at *Dovor*. This License to continue in Force so long as he shall be found capable of well executing the same, and shall duly conform himself to all the Bye Laws, Rules and Orders, made by the said Commissioners, for the better Regulation of such Boatmen. GIVEN at *Dovor Castle*, under my Hand and Seal of Office there, this —— Day of ——— in the Year of our Lord, One Thousand Eight Hundred and ——

By Command of the Constable, Warden, and Admiral,
——— Registrar.

Description of the Boatman.

Age Years
Height Feet Inches
Complexion
Hair
Marks

[*From Mr. E. C. Rutter, Mate of H. M. P. Fire Fly, to Lieut. Benjamin Worthington, R. N.*]

Dover, Nov. 4th, 1836.

Sir,

I beg leave to offer you my thanks for the inspection of your Plan and Model for the proposed improvement of Dover Harbour, and also to state as my opinion, that the

part relating to the Breakwater, extending from the South pier, appears to me as offering a practicable and complete remedy for the present existing difficulties attending the navigation of the entrance of the port, combining simplicity of design with facility of execution; and by a single, but comprehensive method, obviating at once all the most important obstacles at their worst periods of occurrence, whether arising from accumulation of bar, exposure to rough sea with S. W. winds, or low neap tides, which render both the former cases less surmountable.

The projected method of warping vessels by means of the apparatus, at the extremity of the Breakwater, not only offers an advantage of which the port is at present destitute; but will, I conceive, be of great utility to sailing vessels, bound in or out, with scant winds. The only objection which occurs to me, as deserving notice, is that of vessels bound to sea with the wind short from the eastward; but as this might be provided for, in ordinary weather, by kedging, or towing with steam; and as in strong winds and rough sea, also whenever any beach extends from the South Head, it is dangerous or impracticable at present whenever a vessel cannot sail the harbour, I therefore do not consider this single and unfrequent case of sufficient account to be put in competition with the numerous and important advantages to be anticipated from the adoption of the plan.

The proposed enlargement and alterations for the interior of the harbour also appear to me equally well designed, and scarcely less necessary to improving the entrance, there being at present not only a deficiency of space for berthing vessels, but likewise no room to stop them, with strong outerly winds, both which defects, and also the heavy range to which the harbour is now subject, would, I conceive, be remedied by the several improvements detailed in your proposed plan.

I am, Sir,
Your obedient Servant,
E. C. RUTTER.
(Mate of H. M. P. Fire Fly.)

To Lieut. Benjamin Worthington, R. N.

[*From R. Gowlland, Esq. Commander of H. M. Revenue Cutter, Vigilant, to Lieut. B. Worthington, R. N.*]

2, Alfred Place, Dover, Nov. 7th, 1836.

Dear Sir,

In my official capacity, commanding a Revenue Cutter, I have been very frequently in and out of Dover harbour during the past fifteen years; and consequently an interested observer of the collection of the Bar and its movement. And I feel much pleasure in assuring you that I believe your Plan of carrying out a Breakwater, in a southerly direction, from the south head to the edge of the tide way, would *dispose of the beach* in such manner, by the assistance, as you propose, of a strong head of back water, that a *good entrance* would be ensured.

It may be advanced that the carrying out of such a work from the south head, would add to the difficulty of sailing vessels getting to sea with the wind from E. S. E. to S. S. E.; but at the same time it must be admitted that it will lessen the difficulty, the wind being from the S. S. E. to S. S. W. by hauling out by the new work.

The question is, to *make an entrance* that vessels may run for the harbour *fearlessly* in bad weather. Getting to sea with winds (the least prevalent) from the E. S. E. to S. S. E., I believe to be of *a minor consideration,* and I do think will not be seriously entertained, (at this important steam era,) if weighed in the scale against *greater safety* and *shelter* to shipping and *commercial benefit,* and consequent prosperity to Dover—effects that must naturally follow *the removal of the bar* from the mouth of its harbour.

As an inhabitant, I wish sincerely the welfare of the town, and beg you will please to accept my best thanks for your industrious attention to a subject paramount in importance to its prosperous existence. And I remain,

Dear Sir,

Your obedient humble Servant,

RICHARD GOWLLAND,

Commander of H. M. Revenue Cutter, Vigilant.

To Lieut. B. Worthington, R. N.

[*From Mr. W. Mowll to Lieut. Benjamin Worthington.*]

Dover, 8 November, 1836.

My dear Sir,

I hasten to acknowledge the gratification and pleasure I had the other day in seeing your Model for a proposed improvement to the entrance of Dover harbour, and which must have cost you considerable time and expense to bring so completely before the public.

In doing this I am anxious to offer my reasons for approving of your plans; and, however incapable I may be to form a correct judgment upon matters which have for a series of years engaged the attention of the most eminent engineers of their day, to show I arrive at my conclusions from practical nautical experience and observation.

The two great evils which hitherto have prevented this harbour from being considered one of refuge, arise from natural causes—the bar and the sea. Situated as it is in that part of the channel where, during a war, it must be of the first importance to keep a force ready at all times to cope with the light vessels of the enemy; and, in peace, affording the most ready communication with the continent of Europe, it becomes a question of national enquiry, in what way this harbour may be made available at all times, and under all circumstances; and whoever may endeavour to improve its present state, is worthy of consideration and attention.

I will endeavour to make my views clear with regard to the first of these evils, viz. the bar. It is agreed on all hands that the beach progresses from the West to the eastern points of our coasts. It is also generally admitted, that its progress may be traced between high and low water-marks, or along shore. If it were otherwise, the rocks in our immediate neighbourhood, would not have the beautiful weed growing upon them, which is now the pleasure of so many to collect; nor would their interstices continue open, affording shelter to the lobster, &c., of which you and I have often availed ourselves. This acknowledged, we have arrived at one fact to be considered,

The motion of the beach eastward being continuous, it follows that wherever a projection into the sea is made, there, during fine weather, a deposit will be formed on the western

side, quite ready to alter its position the first strong wind from the S. W. It appears that the most convenient place to form this, is provided by Cheeseman's Jetty, and the South Pier-head.

A deposit is thus formed previous to a strong wind from the S. W. When this occurs, a thrashing or whipping of the shore takes place, the reservoirs are emptied, and the bar is formed before and within the harbour, simply because there the natural working of its course is impeded by the North-head; the position and structure of which I have always thought to be productive of a large proportion of the evil, from the sea not passing freely through it. We observe, in gales from the S. W. the sea passing the South-head, striking against the North, rebounding again half way across the harbour's mouth. During all this, the shingle, semi buoyant between the two forces, makes a second deposit; and once begun, goes on in an increased ratio, from the increased difficulty of continuing on its course. We have abundant proof at the jetty under the castle, many formerly in the bay, behind the North-head, Cheeseman's head, and Folkestone harbour, that wherever it is allowed to pass from a projection into the sea, it forms a deep bay on the eastern side, and leaving the rocks to possess all the beauty of a luxuriant field. And why should not this be the case at our harbour's mouth? Simply (with deference) because the North-head projects considerably the angle of the South, in consequence retarding its course, and causes it to make a second deposit. Your plan goes far to remove this. The end of the breakwater being extended so much farther out, I think the beach in its pro gress will pass on without the point of the present head, and be carried on beyond our present consideration.

The other evil as a cause why the harbour of Dover has not been considered one of refuge, is the tremendous sea which falls home to the Pier-heads in any wind from the S. S. E. to even W. S. W., an evil, in my judgment, nearly commensurate with the bar itself.

A vessel intending to make Dover harbour with the wind westerly, will come along shore, giving only Cheeseman's head a berth. In consequence of the tide running the same way, and the extreme narrowness of the entrance, she will be

anxious to haul in for the pier as early as possible, fearing to fall against or behind the North-head. Mark the consequence: crossing the edge of the true flood tide, she enters another, termed the tide out of the bay, said to commence after high water by the shore; but which I am strongly of opinion does so much earlier, from a circumstance which happened to myself very soon after the alteration of Cheeseman's head. Thus entering, she has two forces acting upon her two extremes; the true flood upon her larboard quarter, and the tide from the bay on her starboard bow. The consequences must almost inevitably follow, that she strikes the South-head before she can recover herself; at any rate runs a great risk of doing so.

Your breakwater appears to be admirably adapted to remedy these evils in two ways; first, from extension into the true tide it will enable a ship to recover her steerage way after passing its point; and, secondly, by enlarging the entrance, which I consider effected, the approach will be made more safely, and with greater confidence. If with the wind so short from the westward a ship cannot sail the entrance, she can ride in perfect safety under its lee at her anchor, until assistance can be rendered from the shore.

It remains for me only to consider the egress of vessels, already taken shelter, bound down channel. I will endeavour to do this fairly, and to prove that the breakwater can by no possible argument be considered otherwise than affording facility for the egress of ships, except with the wind from S. E. to East, or E. b. N. only five points of the compass; and then leaving the means of kedging and towing, those already in use, in the same position they are now.

If a ship is enabled to make sail from the Cross-wall and sail the harbour, she will pass on without any consideration of the breakwater, as she does now; but with the wind at East, under the present circumstances, she requires help on the North-head, and often have I witnessed the difficulty of clearing the South-head by light vessels having little way. The breakwater taking a direction, as I understand, S. S. E. six points from the wind, may and will under such circumstances, prove of infinite importance to ships getting to sea by employing hands on a warp broad on the starboard bow, additional impetus will be given at once into the true tide, and very much risk saved.

I am fearful I shall have tired you with this long letter, and only add, that as an improved entrance is the most desirable point, I have kept to it, having no doubt that this once effected, other improvements will grow out of it, and that Dover harbour will be considered by masters of ships bound down channel, not only one of refuge, but the most desirable from its situation westward of the South Foreland.

Make what use of this you please, and receive my assurance that I consider myself bound by every consideration, to be ready at all times to do all in my power to promote the interests of Dover harbour.

I remain,
My dear Sir,
Very truly yours,
WILLIAM MOWLL.

Lieut. Worthington, R. N.

[*From Commanders and Managers of Vessels in the Passage Service, to Lieut. Benjamin Worthington, R. N.*]

Dover, Nov. 12th. 1836.

Sir,

We beg to offer our acknowledgments for an inspection of your Plan and Model for the extension and enlargement of Dover Harbour, and for the trouble you have taken in devoting your time in explaining the principle, and its advantages. As Captains of long and constant experience, engaged in the Passage between Dover and the Continent, and also having a deep interest as Owners, we may be supposed to be no ordinary judges of the defects of Dover harbour, and of what would tend to its improvement in a nautical point of view; and we can assure you that your Plan appears to us to embrace all the advantages desirable within the compass of a dry harbour. The plan proposed for retaining the shingle on the west side of the Breakwater during the neap tides, and sluicing during the springs, is well calculated to remove the bar. The Breakwater extension to the true tide line in a S. S. E. direction, would remove all

those anxieties and difficulties in approaching the harbour with a heavy sea from the southward and westward; and in proceeding to sea under the same circumstances, would give a gradual approach into the sea way, and leave no chance of a vessel being thrown upon her beam ends. Immediately on opening the south head, her way deadened, she either falls upon the north head, or is thrown upon the bar immediately behind it, to the imminent danger of lives and property.

The enlargement of the harbour, &c. would remedy the evils existing in the interior, and is admirably calculated to afford an asylum to the coasting and foreign trade bound down channel with adverse winds, and safety to the vessels belonging to the port, many of which being steam vessels, frequently sustain great damage to their hulls and engines from the violent concussions they are exposed to. The present construction of the harbour, confining the swell, is the great cause of the evils and damage complained of inside the harbour.

Your Plans, we are bound in justice to you, to ourselves, and the commerce of the country of which we form a unit, to affirm, deserve, and we hope will meet with attention, as not only involving the interest of the town, but also that of the nation, both now and at a future period—now, as affording protection from sea risk, and facilitating the communication between this kingdom and the continent of Europe, in two ways, time and power: time, as regards the ingress and egress of the harbour earlier and later upon a tide, by the certainty of a free channel and smooth approach: power, as regards the speed and structure of our vessels, being now obliged to be built to navigate the harbour rather than the channel; the harbours of Boulogne and Calais having capacity to admit steam vessels of much greater power than Dover, thereby possessing superior advantages. In investigating your Plan, Sir, we have endeavoured impartially to seek its defects as well as its advantages; and they are of that minor nature, if defects they really are, as scarcely deserve to be noticed. It would be a clever harbour's mouth indeed that would accommodate every point of the horizon; and as a vessel could sail from the harbour with the wind in a direction

twenty-six points of the compass out of thirty-two, and as the remaining six (the most rare that blow) are from E. to S. S. E. much argument you have not to fear from that trifling circumstance, and we think the facilities that your plan would establish are superior to any thing the harbour ever yet possessed, an unobstructed channel, and a ready mode of warping. Independent of that, there are all the means left of getting to sea that other harbours have in like circumstances, and we would simply observe, who would not rather have your breakwater to contend with, only with a scant wind, than a dangerous bar and a heavy surf?

We trust, Sir, that we shall not trespass on your time and patience with our minutiæ; but the subject we consider of such importance, that we cannot refrain from going largely into it, being as anxious as yourself to see the port of Dover made what it is so capable of, as demonstrated by your Plans.

We are, Sir,

Your most obedient Servants,

Morris Bushell, .. { Commander of the Wellington Steam Vessel.

Samuel Bushell .. { Commander of the Britannia Steam Vessel.

Richard Bushell.. { Managing Owner of the Wellington and Britannia, and Master R. N.

John Hayward, Jun.

John Hayward.

William Hayward, { Commander of the Water Witch Steam Vessel.

William Swaffer, . { Commander of the Royal George Steam Vessel.

To Lieut. B. Worthington, R. N.

[*From W. Lilburn, Esq. late Commander of a Revenue Cruiser, to Lieut. B. Worthington.*]

Dover, 12th Nov. 1836.

Sir,

Having commanded a Revenue Cruiser on the Dover Station from the year 1799 until 1823, and having constantly been in the habit of going in and out of Dover harbour during that time, I have frequently found the great difficulty of approaching it, as well as in going out, from the great accumulation of beach before the harbour's mouth. It used therefore to strike me forcibly, that an extension of the South Pier-head would prevent such vast accumulation of beach, by driving it (with the assistance of the sluices) into deeper water; as the eastern tide would then have a greater power over the beach, and, consequently, force it further into the East bay, where it is mostly required for the protection of the vast property erected there. It would also prevent the heavy sea which falls home to the present Pier-heads, which presents as formidable an evil as the bar itself.

Since my return to Dover in August last, I have seen your Plan for the extension of the pier, (which exactly accorded with my own ideas,) as well as for the enlargement of the harbour, by building a sea-wall on the North side thereof, and must certainly give it as my own opinion, that if adopted, it would be a most judicious, as well as beneficial a plan, as can possibly be effected, as it would not only afford more convenient room for shipping, but lessen, in a great degree, the heavy swell which now sets in when blowing hard from the S. W., from the present very confined state of the harbour, by giving it so much more space to vent itself: and if you can succeed in getting your plans carried into effect, I am of opinion it will afford one of the best dry harbours on this coast. With my sincere good wishes for your success,

I am, Sir,

Your very obedient Servant,

WM. LILBURN.

Lieut. Benj. Worthington.

[*From Commander Thos. Bushby, R. N. to Lieut. Benjamin Worthington, R. N.*]

Dover, 17th Nov. 1836.

Dear Sir,

During my residence at Dover this summer, my attention has been greatly directed to the present situation of the piers and harbour in general.

I felt much gratification in examining your Plan for the improvement of this most important harbour; and having carefully considered all circumstances connected with it, have no hesitation in saying, that the principle is such as to keep the harbour free from bar at all times, more particularly during neap tides; that the extension of the South-pier in the form of a breakwater, would make a safe ingress and egress in blowing weather, which is impracticable with the present relative situations of the piers, even if the bar was entirely removed, as the South-head conducts a heavy sea across the mouth of the harbour, with the wind from the South-west.

That the permanent warping rope in connexion with the arrangements of the capstans, would be of the greatest utility.

The present situation of the lights being no guide whatever in running for the harbour, the proposed alteration would establish good leading marks, and in my opinion ought to be adopted.

The proposed enlargement of the basin, with accompanying improvements as in your plan, would not only cure many of the evils complained of, but are calculated to render Dover harbour one of the most safe and complete ports in England, as a tide harbour.

Should this country ever again be involved in a continental war, with the very general and increased use of steam vessels, the improvement of Dover harbour is of the utmost importance to the coasting trade, and I conceive your plan (if carried into execution) would, in this case, be particularly beneficial.

Permit me to say, that I conceive the whole is arranged with very great judgment, and in a most seamanlike manner. Trusting that your exertions may be properly valued and crowned with success,

I remain, Dear Sir, yours very faithfully,

THO. BUSHBY,

B. Worthington, Esq. Comr. R. N.

[*From Col. Arnold, K. H. Royal Engineers, to Lieut. Benj. Worthington, R. N.*]

Dover, 20th January, 1837.

Sir,

I have had much pleasure in inspecting your model, exhibiting the improvements you propose for the harbour of Dover; and I have no hesitation in saying, that it appears to me, to possess great merit, and to be deserving the most serious consideration of the highest authorities.

If the works now being constructed should not succeed in removing the constant accumulation of shingle at the mouth of the harbour, I should think your project well worth the expense of the experiment; as besides the preventing such accumulation, which you hope to do, by gradually washing away the shingle as it collects to the westward of your breakwater, round the head of which you contemplate its passing, without impeding the entrance of the harbour, your breakwater seems to promise a safer and more certain ingress and egress to and from the harbour—an object of such serious moment in tempestuous weather, when vessels are often afraid to attempt an entrance, though in the greatest distress.

With regard to your project for enlarging the outer harbour, such a measure appears to me not only extremely practicable, but absolutely indispensable to the safety of vessels taking shelter there; though, probably it might be desirable to undertake it on a less extended and expensive scale than you propose; unless it should be conceived that all expense beyond that necessary for the mere security of the shipping, would be defrayed by the wharfage, storing of goods, &c.; or unless the additional defence of the town and bay, which your project embraces, by affording the means of mounting many heavy guns, and thereby presenting a formidable sea battery, should induce the Government to regard it as a national concern, and to take it, as well as, perhaps, the whole of the harbour works, under its own immediate care and superintendence.—An arrangement, however, the propriety and expediency of which, I do not feel myself called upon here to discuss.

I am, Sir, your faithful humble Servant,

JAS. R. ARNOLD, Col. R. Engineers.

Lieut. Benjamin Worthington, R. N.

[*From Col. Cunningham, Royal Engineers, to Lieut. Benjamin Worthington, R. N.*]

London, January 15th, 1838.

Sir,

On my visiting Dover lately, I was not much surprised to find that the new plan for clearing the mouth of the harbour of any accumulation of shingle, had not fully answered the expectations, as I had sometime before seen in the papers that two vessels which wished to take shelter there, in a gale of wind, were obliged to run past, in consequence of a bar having been formed at the entrance. And I was glad to learn that you had determined to again bring forward your project for the improvement of the harbour, of which (as far as I am capable of judging of what is required) I very much approve.

Your project of constructing a Breakwater or jetty from the South pier, in a direction so as not to impede the sailing of vessels from the harbour, appears to me to be what is required: for, in my opinion, it will not only remedy the great defect of the present entrance, by sheltering it during heavy gales from the south-west, and allow vessels to enter, but will prevent the accumulation of shingle so as to form a bar at the entrance, by retaining the shingle at the back of the jetty; which, in small quantities, may be swept into deep water by means of the sluices. And I should presume the shingle so forced from the back of the jetty, will be carried deep into the bay, and not against the north pier, so as to accumulate into a bar across the mouth of the harbour.

With respect to that part of your plan for enlarging the harbour, in front of Amherst Battery, and giving more space for the swell of the sea to act in, and thereby lessen the uneasy riding of vessels at the quays, I have no doubt it would produce that effect; but I should hope that your proposed jetty would not only prevent the accumulation of shingle from forming a bar, but would also, by sheltering the entrance into the harbour, in heavy gales of wind from the South-west, the most prevailing quarter, prevent the heavy swell from entering, which by its re-action from the upright quay walls, occasions the uneasy riding of the vessels, so much complained of. This part of your plan, which must be the most expensive,

may therefore be found unnecessary, unless an extension of the interior space was required, of which I am not aware.

Hoping that your project may meet with the attention which I think it merits,

I am, Sir, your most obedient humble Servant,

THOMAS CUNNINGHAM, Col. R. E.

Lieut. B. Worthington, R. N. Dover.

[*From Colonel Munro, K.H. Royal Artillery, to Lieutenant Benjamin Worthington, R. N.*]

Archcliff Fort, Dover, 5th Feb. 1838.

My Dear Sir,

I am led to thank you for the gratification I experienced this morning from the inspection of your beautifully executed Model of Dover Harbour, with the proposed breakwater, and other improvements; upon the eligibility of which, the several Naval Officers and the Commanders of Her Majesty's Dover Steam Packets, then assembled, seemed fully to concur; and thought it would be highly desirable to carry your plans into completion.

It is not within my province to speak as to the benefits that might arise to the harbour; but I feel no hesitation in stating, that a most *advantageous emplacement* for a powerful Battery would be obtained on your proposed Sea Wall, and that the defences of Dover Bay would be greatly improved thereby.

It appears the more desirable to effect this, in consequence of a part of the former defences of the bay (North's battery) having been done away; and in the event of a war, the proposed battery on the Sea Wall, would give essential security to the very valuable property in the extensive range of buildings situated on the beach.

I remain, my Dear Sir,

Very faithfully yours, &c.

ALEX. MUNRO, Colonel, R. A.

Lieut. B. Worthington, R. N.

P. S. The Naval Officers present were, Admiral Sir E. Hamilton, Admiral Coffin, Commander Boteler, conducting Her Majesty's Steam Packets, and several other Officers of Her Majesty's Packets off duty.

[*From Sir Edward Hamilton, Bart. K. C. B. Vice Admiral of the White, to Lieut. Benjamin Worthington, R. N.*]

Esplanade House, Dover,
Feb. 12, 1838.

Sir,

I cannot quit this place without acknowledging to you the pleasure and gratification I have had, in viewing your Model and Plans for the improvement of this important port. I have likewise to thank you for your frequent personal explanation, and *just reasoning*, on the beneficial results likely to be obtained by the adoption of your suggestions.

I have been well acquainted with Dover harbour for VERY *many years*. About twenty years ago I resided a considerable time on the spot, and was then convinced of the necessity of extending the south pier-head. I consequently very highly approve of your plan of projecting the south pier in the direction of the present entrance, so as to meet the true tide, setting to the eastward. But I am of opinion your object of turning the in-shore westerly current, at the end of your proposed breakwater, into the eastern tide would be certainly attended with great benefit.

Objections have been made to the extension of the south pier-head, as tending to increase the difficulty of egress with south east winds; but I have no hesitation in saying there are various means to be resorted to, familar to every seaman, to obviate any difficulty, *(if ever any did occur,)* of that kind, and which have never yet been made available.

With respect to your proposed improvement of the outer harbour, I have never heard one dissenting voice. Since my early recollections and observation of the outer harbour of Dover, it has been made infinitely worse and more confined, by the building of cross and upright walls, and by taking off the dry dock from it. By your plan of adding old Providence harbour, and allowing the water to flow up to the road going from the York hotel to the beach, you would very much enlarge and improve the outer harbour; and vessels coming in with strong south-west gales, would run at once on the shingle without injury. This enlargement of the outer harbour would, no doubt, to a certain degree, reduce the heavy swell; although I have very much my fears, that it would only mitigate the evil of having erected

upright stone walls round three sides of the harbour—a most injudicious measure. The removal of the present battery down to your proposed sea-wall, from the north pier-head, I most highly approve; and I do hope that such a desirable sea-defence will be taken in hand.

I am quite certain, at some time or other, the necessity of your plans will become evident to those who have had the management of Dover harbour; and I would very much wish those gentlemen to take a look at the improvements going on, from Cherbourg to Dunkirk, on the French coast.

The public owe you a debt of gratitude for the time, attention, and expense, which your model and plans have, from time to time occasioned you; and, as one of the number, I shall rejoice to hear of their adoption.

I remain, Sir,

Your humble Servant,

EDW. HAMILTON,

Vice Adm. of the White.

To Lieut. Benj. Worthington, R. N.

[*From Mr. Thomas Hiller, to Lieut. B. Worthington, R. N.*]

Dover, February 26th, 1838.

Sir,

It is five and forty years since I first entered the port of Dover as a master mariner. From my frequenting it in all kinds of winds and weather, and under various circumstances, I have experienced at different times some of the many evils generally known and complained of, in Dover harbour, viz., the bar and the uncertainty of its formation—counter tides, and the heavy sea that falls home to the heads, without any place to stop a vessel after having entered the harbour, when anchors, cables, and other things in common use for such purposes, are unavailable. These are the principal objections, although there are many minor ones.

From all my experience, all I have seen and all I have heard for preventing and removing the evils, my ideas have always been the same, and which your plans fully embrace: for although large sums have been expended at various periods, it still remains the same hazardous and dangerous harbour as before.

It remains for me to thank you for the inspection of your model, and for the clear explanation you have given me of all its principles; and I have no hesitation in saying, that, in my opinion, it comprehends every thing to make Dover Harbour a safe and commodious port; and in my humble opinion only requires to be seen by those in authority to insure its adoption. With every good wish that you may speedily see Dover Harbour considerably improved, which it cannot fail to be by your plans,

I am, Sir,

Your obedient humble Servant,

THOMAS HILLER.

Lieut. Benjamin Worthington, R. N.

[*From Admiral Francis Holmes Coffin, to Lieutenant B. Worthington, R. N.*]

Dover, 28th Feb. 1838.

Sir,

I must beg leave to thank you for the gratification I have derived from the inspection of your admirable Model of Dover Harbour, with your proposed Breakwater or jetty from the South-pier.

It appears to me that your plan, or some other similar to it, is absolutely necessary, as a shelter for vessels, both coming in and going out of the harbour, having witnessed this winter several in distress, that were anxious to come into this port, in consequence of the state of the weather, obliged to bear up for Ramsgate, owing to a heavy swell setting into this Harbour of refuge,—improperly so called,—with the wind from the South-west. It will likewise, in a great measure, prevent the great accumulation of shingle at the entrance. As for your plan of enlarging the harbour, that possibly may not be immediately necessary, as I consider the projected jetty will prevent that great swell that sets into the harbour from the South-west, so as to render the outer harbour nugatory in bad weather. At a future period it might be found

necessary to adopt your plan of enlarging the harbour, and upon the proposed sea-wall, a most powerful battery might be erected for the protection of the town, as well as the shipping in the roads. As for the guns at the Castle and the Heights, they would have but little effect. I would recommend strongly your laying your Model before Lord Minto and the Lords of the Admiralty. The public are much in your debt for the attention, time, and expense you have been at, which your Model has from time to time occasioned you; and which you have so liberally bestowed. As an individual, I beg leave to repeat my thanks to you; and trust you will be afforded an opportunity of putting your plans into execution. May every success attend it, as in my humble opinion, yours is the only one I consider feasible, to make this place a Harbour of Refuge.

I beg leave to remain, Sir,
Your obedient Servant,
FRANCIS HOLMES COFFIN.

To Lieut. Benjamin Worthington, R. N.

[*Mr. John Skilling to Lieut. Benjamin Worthington, R. N.*]

Dover, March 5th, 1838.

Sir,

Having heard your Plan and Model for the improvement of Dover harbour highly spoken of, it created in me a desire to inspect them; and I can but express to you the gratification I experienced in doing so. I feel in duty bound to send you my humble testimony in favour of the advantages that would be produced by their adoption; which would, under all circumstances, establish one of the best dry harbours on the coast. It may be thought that I am not capable of giving an opinion in a matter that has involved so many difficulties, and that has tried the skill of so many practical men. I acknowledge that I may be, as relates to engineering; but as to the nautical principles of your plans, I think I ought to know something about them, (unless I have been stowed away in a cable tier all my life,) having in the first place served an apprenticeship out of the port; and, in the

last, been master and part owner of the brig Liberty, 181 tons, twenty-five years; the largest registered vessel belonging to Dover, and engaged in the Baltic and coal trade of this port. One thing I pledge you, Sir, that I would not compromise my opinion as a sailor, to flatter you, or favor your plans; but it is my sincere opinion that they are well calculated to remove all the worst evils the harbour is subject to, without establishing one nautical objection. Wishing them the consideration they deserve,

Believe me to remain, Sir,
Your obedient humble Servant,
JOHN SKILLING.

Lieut. Benjamin Worthington, R. N.

[*From Second Masters of Her Majesty's Steam-packets, to Lieut. Benj. Worthington, R. N.*]

Dover, March 5th, 1838.

Sir,

Your proposed Plan of a Breakwater for improving the entrance of Dover Harbour, we not only consider ingenious, but *the one* most adapted to answer *practical nautical* purposes, embracing so many desirable ends. The prominent (to say nothing of minor) points alone, are in our estimation deserving of public attention and support. In the first place, extending the mouth of the harbour, giving vessels a space sufficient to counteract the permanent evils of the opposing flood tide and bay eddy, at present so inimical to entering the harbour, (even in the finest weather,) would be attained. And secondly, we are of opinion the great benefit will be found in S. westerly gales, with a heavy sea from that quarter, rendering the now contracted entrance, where the obstacles and difficulties of bar, surf, and bay eddy are combined, comparatively smooth, and a vessel would consequently then be under the command of her helm. Thus will the harbour be made easy of access, and a place of refuge, when most needed; and which for want of a similar protection has not been attempted by vessels in heavy weather.

On the other hand we do not consider the situation of the Breakwater an additional impediment in leaving the Harbour with a short Easterly wind, as in its present state this object cannot be effected but in very fine weather, in which your plan of warping from the end, will even prove an assistant.

Permit us to observe we feel ourselves called upon to offer these remarks, as those deeply interested in a plan promising to surmount such paramount obstacles; also, as those who have had years of continued and unremitted experience day and night; who well know the existing difficulties, and are desirous of seeing your admirable design brought into operation, even for our personal benefit.

Our attention was not less directed to the novel principle of a Reservoir to receive the deposit of shingle during the neap tides, that has to the present period naturally located itself as a barrier across the entrance, when the artificial means have been inefficient for its removal; but your plan of retention during such tides, seems even to offer a possibility of attaining the object so many years sought, viz. the keeping the harbour free from a bar.

With our grateful acknowledgments for your laudable and indefatigable exertions in this not only local, but national object,

We remain, Sir,
Your very humble Servants,

S. Hare .... Second Master of Her Majesty's Steam Packet Beaver.

Ed. Hare.... Second Master of Her Majesty's Steam Packet Ariel.

H. Sclater .. Second Master of Her Majesty's Steam Packet Widgeon.

Lieut. Benjamin Worthington, R. N.

[*From Pilots belonging to Her Majesty's Admiralty Packets, to Lieut. B. Worthington, R. N.*]

Sir,

We, the undersigned Pilots belonging to Her Majesty's Admiralty Packets, do hereby certify that we have inspected the Plans and Model for the improvement of Dover Harbour, proposed by Lieut. Benjamin Worthington, R. N. and maturely considered the same; and it is our opinion that the harbour would be extensively benefited by their adoption, and which would be an advantage to the public service, and the shipping interest generally.

Given under our hands, at Dover, this 19th day of March, 1838.

Edward Wood
Thomas Williams
R. Knight
R. L. Canney
James Anderson

To Lieut. Benjamin Worthington, R. N.

Besides the above Testimonials, the PLANS and MODEL have been inspected by the following Persons:

His Grace the Duke of Wellington, and the Hon. Commissioners of Dover Harbour.
Lord George Lennox, M. P.
Major Matson, R. E.
Rev. Mr. Sayer
Hon. C. C. Cavendish
Capt. Boldero, R. E. M. P.
Grenville Berkeley, Esq.
James Bradshaw, Esq. M. P.
Capt. Smart, R. E.
Major Hammond
Capt. Dickinson
Dr. Shepherd
Major Dickson, R. A.
W. Wigram, Esq.
Lord Graves
Lord Grimstone, M. P.
Sir John Rennie, C. E.
Capt. Lynn, H. E. I. C. S.
Capt. Sir Wm. Edw. Parry, R. N.
Sir John Lambert
Capt. Lambert, R. N.
Hon. Capt. Sir Fleetwood Pellew, K. C. H.
Gen. Sir Alex. Dickson, R. A. K. C. B. K. C. H.
Col. Cunningham, R. E.
The Captains Martin, R. N.
The Hon. Adm. Elliot, C. B.
R. Steuart, a Lord of the Treasury

Hon. Mr. Knox
Rev. Mr. Farbrace
Marquis of Ely
Gen. Sir W. Hutchinson
Major Hutchinson
Capt. Larkins
Lord Loftus, and
Lord Augustus Loftus
Lord Fitzroy Somerset
Lord Southampton
His Grace the Duke of Sutherland
Earl St. Vincent
Hon. Mr. Beauclerk
Admiral Sir Thos. Byam Martin, G. C.B.
S. M. Latham, Esq.
Philip Hardwick, Esq.
A. Hammond, Esq.
J. S. Yeats, Esq.
Lt. General Sir Rufane Donkin, Bart. F. R. S.
Major Gen. Sir H. Montresor
E. Edwards, Esq. C. E.
J. Pembrooke, Esq.
James M'Intosh, Esq.
Lieut. Becket, R. N.
Commander Sherrer, R. N.
Col. Thompson, R. E.
Sir John Rae Reid, M. P.
M. C. Cotton, Esq.
Edw. Rice, Esq. M. P.
John Bayley, Esq.
B. Belcher, Esq.
Sam. Poynter, Esq.
G. Berkely, Esq.
Mr. Radford
B. Baring, Esq.
Francis Baring, Esq. M. P.
John Pooley, Esq.
L. Stride, Esq.
J. Herapath, Esq.
Col. Raikes

And many others whose Names are not recorded.

APPENDIX.

[*From the Hon. Commissioners of Dover Harbour to Lieut. Benjamin Worthington, R. N.*]

Dover, 18th Nov. 1836.

Sir,

I beg leave to send you a copy of the Minute which was yesterday made at the Harbour Board.

And remain, Sir,

Your obed. Servant,

JOHN SHIPDEM, Register.

"Ordered, that the Letters sent by Mr. Worthington, "read this day at the Board, from certain of the Cinque Ports "Pilots, the Dover Harbour Pilots and Boatmen, Edward "Charles Rutter, Mate of his Majesty's packet 'Firefly;' "William Lilburn, late Commander of his Majesty's Revenue "cutter 'Lively;' Richard Gowlland, Commander of his "Majesty's Revenue cutter 'Vigilant;' William Mowll, late "of the East India service; the Commanders of four of his "Majesty's Post-office packets; the Owners and Masters of "the 'Wellington,' 'Britannia,' and 'Waterwitch,' steam-"vessels; the Master, one Warden, and seven of the Fellow-"ship of the Cinque Ports Pilots; with reference to Mr. "Worthington's Plan for the Improvement of Dover Har-"bour, be referred for the consideration of Mr. Walker, "and that Mr. Worthington be informed thereof."

[*From the Hon. Commissioners of Dover Harbour to Lieut. Benjamin Worthington, R. N.*]

At a Session of the Honorable Warden and Assistants of Dover Harbour, holden the 27th of October, 1837,

"The Board considered Mr. Worthington's Plan for the "Improvement of Dover Harbour, and heard Mr. Walker's "opinion thereon. Considering all circumstances, the Board "felt that they cannot carry Mr. Worthington's Plan into "execution, and ordered that the Plans be returned to him, "with the Thanks of the Board for the interest he has taken "in the Harbour."

Extracted from the Minutes,

JOHN SHIPDEM, Register.

To Lieut. Worthington, R. N.

A Statement of the Income of Dover Harbour.

YEARS.	From tonnage duty on shipping.	GROSS RECEIPTS.
1820-21	£10,669	£17,544
1821-22	10,382	24,383
1822-23	9,646	16,083
1823-24	5,921	14,415
1824-25	5,303	12,504
1825-26	5,996	16,201
	£47,917	
Average tax on shipping for six years	£7,986	

From 1826-27 to 1832-33, £46923

Average ..... £6,703 and making an average tax on the shipping interest, for the 13 years, of £7295 per annum.

DOVER HARBOUR.

A List of the Acts of Parliaments which have been passed from time to time, under various monarchs, which shews the interest that has been taken by the Governments of the different periods, since the days of Queen Elizabeth.

1581	.....	23 Elizabeth
1589	.....	31 ,,
1593	.....	35 ,,
1597	.....	39 ,,
1601	.....	43 ,,
1603	.....	1 James I
1662	.....	13 & 14 Charles II
1700	.....	11 & 12 Will. III
1703	.....	2 & 3 Ann
1718	.....	4 George I
1723	.....	9 ,,
1724	.....	10 ,,
1738	.....	11 George II
1758	.....	31 ,,
1786	.....	26 George III
1794	.....	34 ,,
1828	.....	9 George IV, chap. 31
1836	.....	6 & 7 Will. IV

The two last Acts are those by which the present authorities are governed, the preceding ones being cancelled.

The CHARTER dated 6th Oct. 1606, was granted to the following Commissioners:

Henry Howard, Earl of Northampton	Thomas Hartfleete, Knt.
Thomas Fane, Knt.	John Boys, Knt.
George Byng, Mayor	Edward Boys, Knt.
Francis Fane, Knt.	Matthew Hadd, Esq.
George Fane, Knt.	Henry Heyman, Esq.
	William Monying, Esq.

The present Commissioners are

His Grace the Duke of Wellington	Sir Edward Knatchbull, Bart.
R. H. Jenkinson, Esq.	Sir J. W. H. Brydges, Knt.
The Mayor of Dover	Earl of Guilford
Sir H. Oxenden, Bart.	J. P. Plumptre, Esq. M. P.
W. O. Hammond, Esq.	Sir Brook W. Bridges, Bart.
	Fred. Edw. Morrice, Esq.

FINIS.

ERRATUM. Page 121, last line of Note, for "James Hanker," read "J. Hawker."

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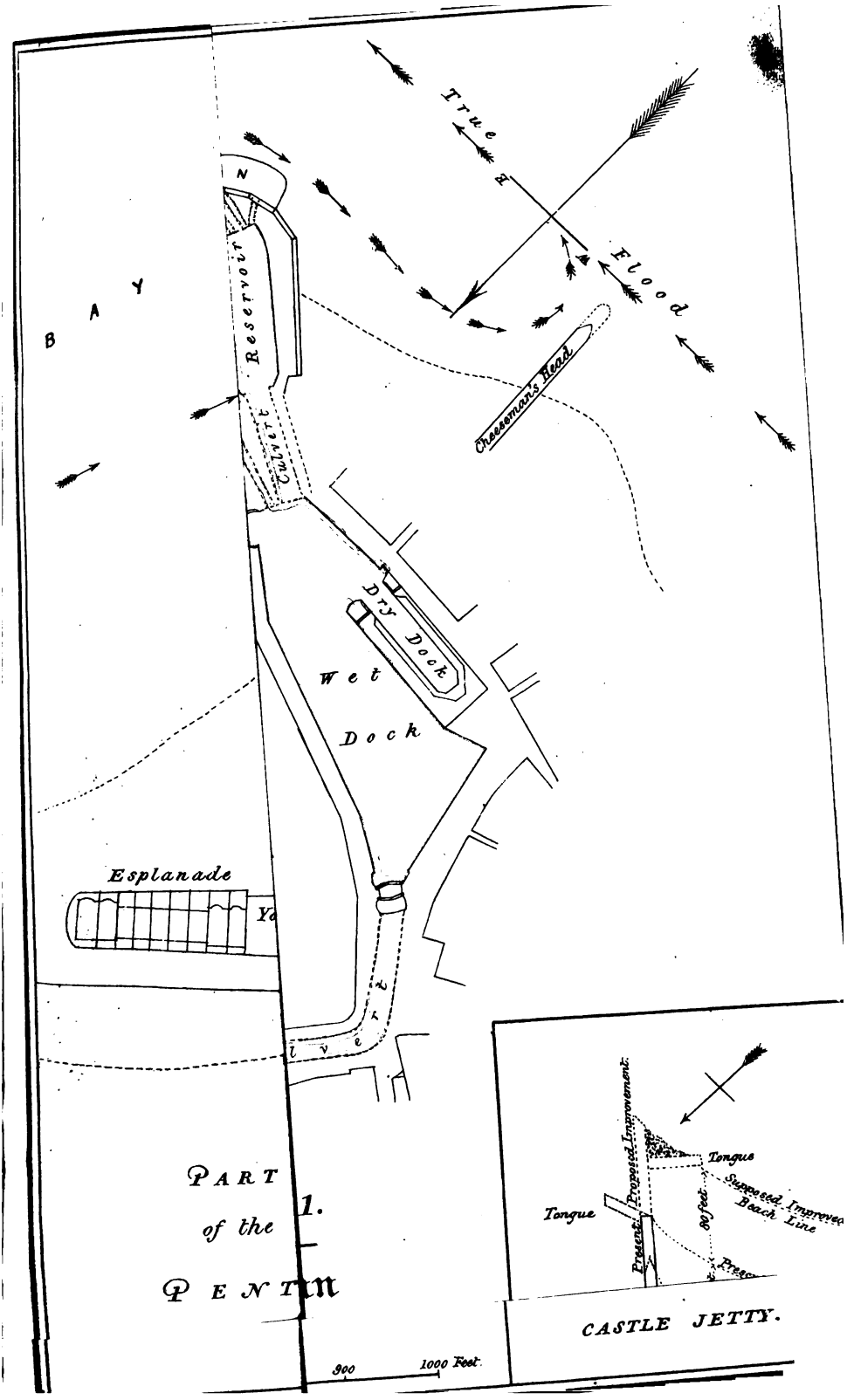

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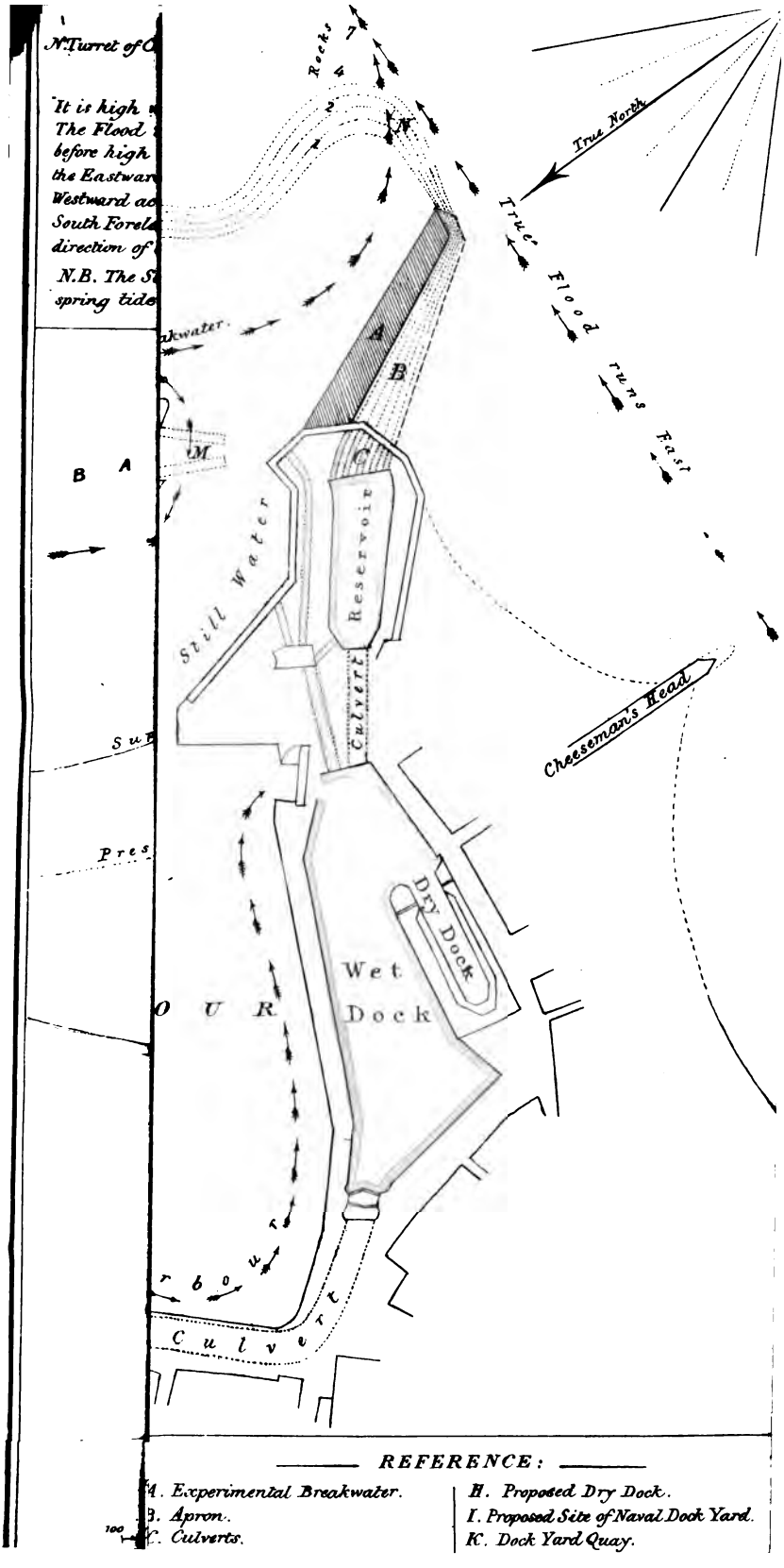
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REFERENCE :
A. Experimental Breakwater.
B. Apron.
C. Culverts.
H. Proposed Dry Dock.
I. Proposed Site of Naval Dock Yard.
K. Dock Yard Quay.

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PLAN
of
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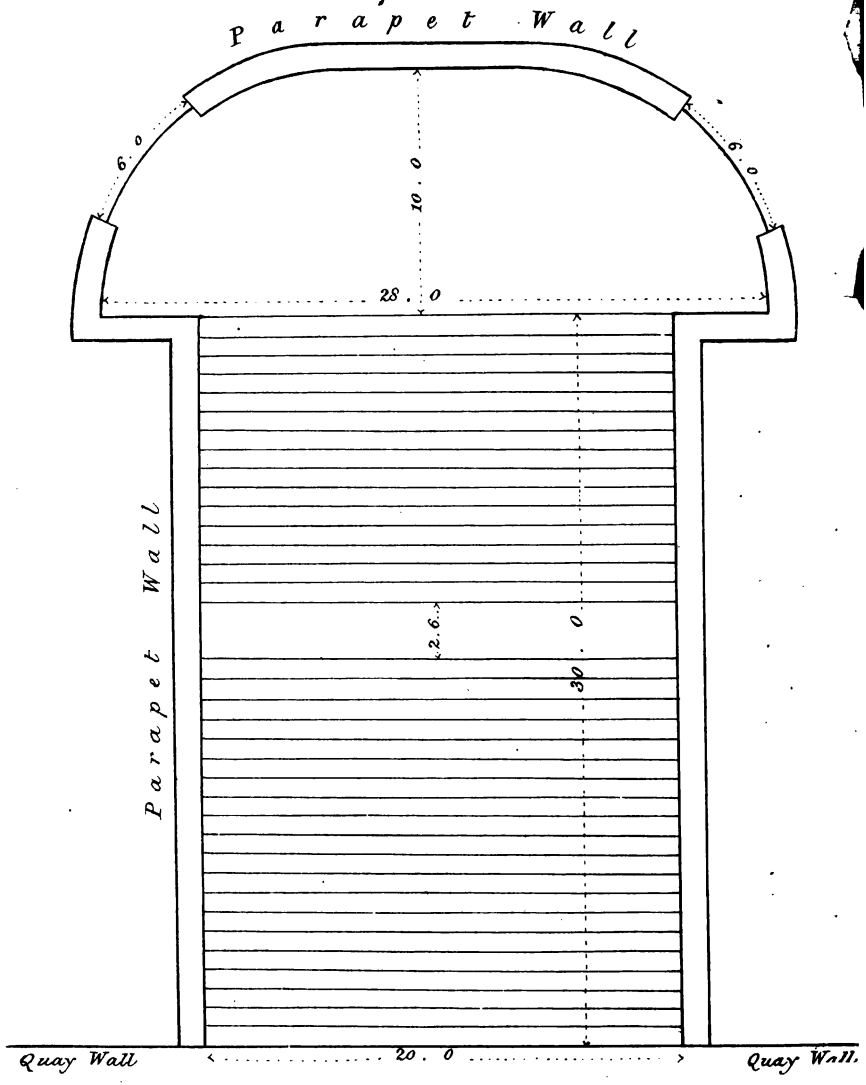

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